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June 1990

Tongass Land Management Plan Revision

Draft Environmental Impact Statement

Appendix, Volume I

Tongass Land Management Plan Revision

Draft Environmental Impact Statement

Appendix, Volume I

A. Issue Identification

B. The Modelling and Analysis Process

C. Roadless Areas

D. Research Natural Areas

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APPENDIX A

APPENDIX A

ISSUE IDENTIFICATION

IDENTIFYING ISSUES

In late 1987, over 4,000 copies of preliminary issues defined by the Forest Service were distributed to those expressing an interest in management of the Tongass. The preliminary issues were developed after reviewing what people had said during previous planning efforts. Also, over 22,000 homes and businesses received the preliminary issues as an insert in seven Southeastern newspapers. Following distribution of these issues, workshops were held in 33 Southeast Alaska communities to review and discuss the revision process and the proposed issues. To get as many people involved as possible, news releases were aired on radio and television and notices were posted throughout communities and published in local newspapers.

Early in 1988, over 600 letters arrived at the forest planning office, with comments on the original list of issues. These letters were from individuals, business people, representatives of special interest groups, and officials holding positions in either State or community governments. The great majority of responses came from individuals and organizations within Southeast Alaska (Table 2-1). A wide spectrum of viewpoints representing every level of interest was received. Each letter was read, and comments were coded by subject, then entered into a computerized database. As specific responses were reviewed, it became clear that the public was most concerned with two major types of issues: 1) land allocation issues and 2) community lifestyles, stability and jobs issues.

RELATIONSHIP OF IDENTIFIED ISSUES TO THE TONGASS LAND MANAGEMENT PLAN

In the 1979 Tongass Land Management Plan, eight issues were identified and addressed: land allocation, community lifestyles, community stability and jobs, wilderness preservation, Admiralty Island, fish and wildlife, aquaculture, and minerals. With the exception of Admiralty Island and aquaculture, issues identified in 1979 continue today. Of particular concern now, as then, are the amount and location of land allocated to scenic and recreation values, fish and wildlife habitat, timber harvesting, mineral exploration and development, and wilderness. In addition, there continues to be concern about maintaining lifestyles, community stability, and jobs.

DISCUSSION OF SELECTED ISSUES

The major issues are presented below in the form of questions. An overview of each issue is presented, followed by a description of the interrelationship of the issue with other resource issues and by indicators of responsiveness to the issues. The degree to which issues can be resolved is limited by the fact that

managing for some uses does not always complement other uses. There is not likely to be one management approach that is fully responsive to all issues.

TABLE 2-1
NUMBER OF INDIVIDUAL RESPONDENTS BY COMMUNITY

Community	Number of Respondents	Community	Number of Respondents
Angoon	4	Klawock	3
Auke Bay	2	Meyers Chuck	5
Coffman Cove	10	Pelican	43
Craig	6	Petersburg	52
Douglas	8	Point Baker	6
Elfin Cove	4	Port Alexander	2
Edna Bay	5	Rowan Bay	1
Gustavus	30	Sitka	67
Haines	15	Skagway	2
Hobart Bay	1	Tenakee Springs	5
Hollis	1	Thorne Bay	4
Hoonah	122	Tokeen	1
Hydaburg	2	Ward Cove	1
Hyder	2	Wrangell	26
Juneau	52	Yakutat	4
Kasaan	1	Other Alaska	13
Ketchikan	84	Lower 48	38
Subtotal	346	Subtotal	276
	Total	622	

ISSUE

WHAT AREAS ON THE TONGASS NATIONAL FOREST SHOULD BE MANAGED TO EMPHASIZE SCENIC RESOURCES?

The Tongass National Forest is a unique combination of land and marine environments. The Forest includes a narrow mainland strip and over one thousand offshore islands. Together the islands and mainland provide nearly 13,000 miles of meandering shoreline, interspersed with numerous bays. The mainland and islands are mountainous, often abruptly rising from sea level to elevations of 3,000 feet and more. Beyond the mountains on the mainland, huge ice fields

produce glaciers easily viewed from the waterways. World-class scenery, resulting from the unique interaction of mountain and ocean environments, draws thousands of visitors each year. These visitors view Southeast Alaska from cruiseships or ferries traveling the popular Inside Passage water route. Tourism has become a major industry in Southeast Alaska, similar to timber harvest and commercial fishing in terms of the number of people directly employed. Tourism has helped diversify economies of some communities. Maintaining the scenic quality of the Forest landscape is of concern to Forest visitors, individuals, groups, businesses, and communities.

The majority of individual respondents from several Southeast Alaska communities want to see more emphasis placed on managing for scenic resources. These communities include: Angoon, Auke Bay, Craig, Douglas, Edna Bay, Gustavus, Haines, Juneau, Klawock, Pelican, Petersburg, Point Baker, Sitka, Tenakee Springs, Thorne Bay, and Wrangell. The majority of respondents from the Lower 48 also want more emphasis placed on managing for scenic resources. Several cities and organizations expressed similar interest in managing the Tongass to emphasize natural scenic quality. These include: Alaska Discovery, City and Borough of Sitka, City of Tenakee Springs, City of Yakutat, Hollis Community Council, Inc., Juneau Area State Parks/Advisory Board, Juneau Audubon Society, Narrows Conservation Coalition, Sierra Club, Southeast Alaska Conservation Council, and Yakutat Fishermen's Association.

Individuals and organizational representatives want scenic screens along Alaska Marine Highway routes, roads, and streams; and around their communities. They stress maintaining scenic quality in these areas because of the importance of tourism, recreation and aesthetics. They are concerned that timber harvesting, roads and log transfer facilities will have a negative impact on tourism, recreation, and aesthetics associated with natural scenic quality.

The majority of respondents living in communities more dependent on timber harvesting, including Ketchikan, Craig, Hobart Bay, Hoonah and Wrangell, want to continue to be able to harvest timber along Alaska Marine Highway routes, roads, and streams; and around their communities. The Ketchikan Chamber of Commerce and the City of Wrangell recommend that some of the areas be cut progressively at a moderate rate rather than heavily at a rapid rate to maintain scenic quality and to display a multiple-use forest. They are concerned that allocating land along ferry routes to maintain natural scenic quality will cause reductions in the annual timber harvest.

Individual respondents from Coffman Cove and Skagway and from organizations including Alaska Loggers Association, Inc., and Snow Mountain Pine Company suggest that the Forest be managed for both scenic quality and timber harvesting.

Opinion regarding management for scenic quality was split in the communities of Sitka and Wrangell with half of the respondents wanting more emphasis on scenic quality; half wanting the Forest to be managed for both scenic quality and timber harvesting. Respondents from Thorne Bay were split with half wanting more emphasis on scenic quality; half wanting less emphasis. Half of Hobart Bay respondents want present emphasis on scenic quality to continue, while half want less. Respondents from Hoonah were split three ways in their opinion of emphasizing scenic quality with some wanting more, others wanting less, and still others wanting current scenic quality to be maintained.

ISSUE

WHAT AREAS SHOULD BE MANAGED TO EMPHASIZE RECREATION OPPORTUNITIES?

Dense spruce and hemlock rain forests, active glaciers, salmon, whales, eagles, bears, and miles of protected waterway, combined with the vast size and remote character of the Forest, provide a truly unique natural setting. For the most part, roads and trails are few and are concentrated around communities. Outdoor recreation opportunities offered by the Tongass National Forest play an important role in the quality of life for the majority of Southeast Alaska residents. Many families have favorite places where they fish, hunt, beachcomb, hike, or just go to get away. Visitors and residents alike recognize the unique recreation experience afforded by lack of roads and necessity for boat access.

The majority of individuals responding from Angoon, Auke Bay, Craig, Douglas, Gustavus, Juneau, Klawock, Pelican, Petersburg, Point Baker, Skagway, Tenakee Springs, Thorne Bay, and Wrangell want to see more emphasis placed on managing for recreation. Likewise, the majority of respondents from the Lower 48 want additional emphasis placed on managing for recreation. Cities and organizations wanting more emphasis placed on managing for recreation include: Alaska Discovery, City of Tenakee Springs, City of Yakutat, Haida Corporation, Hollis Community Council, Inc., Hyder Community Assoc., Inc., Island Riders Association, Juneau Area State Parks/Advisory Board, Juneau Audubon Society, Ketchikan Area State Pards Advisory Board, Northwest Rivers Council, Sierra Club, Sitka Advisory Committee, Sitka State Parks Advisory Board, Southeast Alaska Conservation Council, State Parks and Outdoor Recreation and the Wildlife Society.

These individuals and organizations are concerned about what might happen to recreation places as a result of other resource management activities. Many point out that timber harvesting, roading, and other by-products of logging, and mineral exploration and development, can result in unwelcome changes in scenery, solitude and traffic patterns. These groups emphasize the need for undeveloped recreation areas, additional trails, and cabins.

Hyder Community Association Inc., Ketchikan State Parks Advisory Board, Western Forests Industries Association, and Hull Cutting Company indicate that additional road access to recreation areas is important. They point out that roads built for logging are used extensively by recreationists. That being the case, the timber industry wants recreation to share road costs. Rather than undeveloped recreation areas, some communities, including Ketchikan and Wrangell, emphasize the need for developed sites to provide recreation for the many campers that travel by ferry.

The Alaska State Society of American Foresters, City of Wrangell - Economic Development Director and the FMC Gold Company want a mix of management emphasis placed on recreation and other Forest uses including timber harvesting and mining. Yakutat Fisherman's Association wants current management emphasis on recreation to continue.

Opinion was split between individual respondents in the communities of Coffman Cove, Edna Bay, Haines, and Hoonah. About half want more emphasis on recreation, and half are satisfied with the current mix of emphases. Likewise, respondents from Hobart Bay were split. About half want more emphasis on recreation, while half want less. The majority of respondents from Sitka requested that less emphasis be placed on managing for recreation, while Ketchikan respondents are satisfied with the current management emphasis.

ISSUE

WHAT METHODS SHOULD BE USED TO PROTECT RESIDENT AND ANADROMOUS FISH HABITAT?

The fisheries resource on the Tongass contributes significantly to the economic, recreational, and subsistence needs of residents and non-residents alike. Most of the salmon caught in the waters of Southeast Alaska and in the Gulf of Alaska, originate in streams and lakes lying within the boundaries of the Tongass National Forest. Streamside habitat provides important shelter, hiding places, food, and rearing areas for Alaska's salmon. Changes in streamside habitat can alter a stream's ability to produce fish.

Fish resources have a large economic impact throughout Southeast. The majority of respondents from Angoon, Craig, Douglas, Edna Bay, Gustavus, Haines, Hoonah, Juneau, Ketchikan, Pelican, Petersburg, Point Baker, Port Alexander, Tenakee Springs, Thorne Bay, and Wrangell believe the value of these fisheries is greater than the value of timber production. They believe fish habitat should always be given preference over timber harvest and related activities. They recommend that streamside zones be established to protect resident and anadromous fish streams and riparian areas. Those responding from the Lower 48 want additional emphasis put on managing the Forest for fish. Cities and organizations holding similar views include: City and Borough

of Sitka, City of Port Alexander, City of Tenakee Springs, City of Yakutat, Friends of Berners Bay, Haida Corporation, Hollis Community Council, Inc., Hyder Community Assoc, Inc., Juneau Audubon Society, Narrows Conservation Coalition, Sitka Advisory Committee, Southeast Alaska Conservation Council, State of Alaska - Office of the Governor, Sumner Strait Fish and Game Advisory Committee, USDI Fish and Wildlife Service, Wildlife Society, and Yakutat Fish and Game Advisory Committee.

Coffman Cove, Hobart Bay, and Hydaburg respondents believe the current mix of management for fish and timber harvesting is sufficient, as does the City of Wrangell - Economic Development Director, and Hull Cutting Co. Organizations requesting a mix of management on fish and other Forest resources include: Alaska Loggers Association, Inc., Alaska State Senate, Alaska State Society of American Foresters, FMC Gold Company, Koncor Forest Products Co., and Western Forest Industries Association.

Timber interests, including Whitestone Logging, and Snow Mountain Pine Company, point out that there is little scientific evidence supporting the benefit of streamside zones to fish habitat. They believe that streamside zones are extremely susceptible to blowdown. They also point out that as timber harvesting has continued, salmon harvests have been rising dramatically in the last ten years.

Those responding from Sitka and Skagway are split with about half wanting more emphasis on fish and half wanting the same management emphases mix.

ISSUE

WHAT AMOUNT OF OLD-GROWTH AND UNDEVELOPED HABITAT SHOULD BE MANAGED FOR THE PROTECTION OF WILDLIFE?

The Tongass National Forest supports a wide variety of wildlife species, including the largest populations of brown bears and breeding bald eagles in the world. The Tongass is also somewhat unique with the abundance of marine mammals and seabird colonies. Many species, which are endangered elsewhere in the United States, are abundant on the Tongass. Alaskans and visitors find sport and subsistence hunting of moose, brown and black bears, mountain goat, and deer. Many species of furbearers, waterfowl, upland game birds, and small game also provide the public with sport, commercial, and subsistence use opportunities. Demand is also growing for opportunities to watch and photograph wildlife.

Many wildlife species abound on the Forest, using its old-growth forests for food and cover. The majority of respondents from a number of communities including, Angoon, Craig, Douglas, Edna Bay, Gustavus, Haines, Hoonah, Juneau, Ketchikan, Klawock, Pelican, Petersburg, Point Baker, Port Alexander, Tenakee

Springs, Thorne Bay, and Wrangell are concerned that logging, and other development of natural resources in these old-growth stands, has a detrimental effect on the habitat available for wildlife species. This, in turn, decreases the availability of these resources for human use. Individuals from these communities recommend that old-growth habitat, especially that near communities, be allocated to protect sport, commercial, and subsistence wildlife uses. The majority of respondents from the Lower 48 also want old growth managed for wildlife rather than for timber harvesting.

In addition to individuals, a number of cities and organizations want management to emphasize wildlife. These include: City and Borough of Sitka, City of Port Alexander, City of Tenakee Springs, City of Yakutat, Friends of Berners Bay, Hyder Community Assoc., Inc., Juneau Audubon Society, Narrows Conservation Coalition, National Marine Fisheries Service, National Wildlife Federation, Sierra Club, Southeast Alaska Conservation Council, State of Alaska - Office of the Governor, Sumner Strait Fish and Game Advisory Committee, USDI - Fish and Wildlife Service, Wildlife Society - Alaska Chapter, Yakutat Fish and Game Advisory Committee and Yakutat Fishermen's Association.

Respondents from Coffman Cove, Hobart Bay, Hydaburg, and Sitka think that current management emphasizing wildlife and timber harvesting is adequate. Organizations with similar views include: Alaska Loggers Association, Inc., Alaska State Senate, Alaska State Society of American Foresters, Koncor Forest Products, Hull Cutting Co., and Ketchikan Chamber of Commerce They believe that well-managed logging projects provide human access to wildlife and can improve wildlife habitat. They are concerned that allocating old-growth areas to protect wildlife will result in reductions in the annual timber harvest.

Respondents from Skagway were split in their opinions. Half want more emphasis on managing for wildlife while half prefer a mix of emphases.

ISSUE

WHAT SHOULD THE FOREST SERVICE DO TO CONTINUE PROVIDING SUBSISTENCE OPPORTUNITIES?

For some people, subsistence is hunting, fishing, trapping and gathering natural resources to provide needed food which is supplemental to their income. For others, especially Southeast Alaska's Native Americans, subsistence is much more than collecting food: it is a lifestyle that preserves cultural customs and traditions, reflecting deeply-held attitudes, values, and beliefs. Because both commercial fishing and timber harvesting employment opportunities are seasonal and cyclical, subsistence use of resources is important to many Southeast Alaskans.

Individual respondents from Angoon, Douglas, Edna Bay, Gustavus, Haines, Juneau, Pelican, Point Baker, Port Alexander, and Tenakee Springs want management for subsistence to be emphasized. Cities and organizations sharing this viewpoint include: City of Port Alexander, City of Tenakee Springs, City of Yakutat, Haida Corporation, Hoonah City Council, Klawock Cooperative Association, Narrows Conservation Coalition, Sitka Advisory Committee, Sumner Strait Fish and Game Advisory Committee, and Yakutat Fish and Game Advisory Committee. These groups are concerned that timber harvesting and its associated development activities adversely affect habitat critical to important fish, wildlife, and other subsistence resources. The most-mentioned concern was that road use by non-local people results in competition with rural residents for Forest resources. The result could be a decline in numbers of local subsistence species and more restrictive hunting regulations. To maintain subsistence opportunities, these organizations and individuals recommend that old-growth habitat be retained around communities.

Other individual respondents from Coffman Cove, Hobart Bay, Ketchikan, and Thorne Bay and organizations including: Hollis Community Council, Inc., Ketchikan Chamber of Commerce, Koncor Forest Products Co., and Yakutat Fishermen's Association think that current management emphasis on subsistence is adequate. Some believe that timber harvest and road construction have a positive effect on subsistence opportunities. They think that deer and bear make considerable use of clearcuts, that opening up the forest provides additional sources of food for subsistence species, and that roads increase hunter access to these species. They do not think that maintaining old growth around communities is necessary to ensure subsistence opportunities.

Half of those responding from Craig and Petersburg want more emphasis on subsistence while half want less emphasis. Respondents from both Sitka and Wrangell are split three ways in their opinion about how to manage for subsistence. Some want more emphasis, some want less, and a third group is satisfied with existing management.

ISSUE

WHAT AREAS OF THE TONGASS SHOULD BE MANAGED TO EMPHASIZE TIMBER HARVESTING?

In the 1950's, Congress began encouraging establishment of an Alaskan timber processing industry to promote stable year-round employment. To make this proposal economically attractive to the timber industry, long-term timber sale contracts were established. Today, only two of these contracts are still in effect. Congress assured a supply of timber to the purchasers of these contracts and to independent contractors when it passed the Alaska National Interest Lands Conservation Act (ANILCA) in 1980. ANILCA provided for the availability of 4.5 billion board feet of timber each decade from the Tongass

National Forest. To reduce the cost of harvesting marginally economical timber and to offset the effects of designating approximately 5.4 million acres of Wilderness elsewhere on the Tongass, ANILCA also resulted in establishment of the Tongass Timber Supply Fund (TTSF) .

Public opinion is sharply divided on whether or not the long-term contracts, the current timber sale program of 4.5 billion board feet per decade, and the TTSF should be maintained. The majority of individual respondents from Coffman Cove, Hobart Bay, Hoonah, Hydaburg, Ketchikan, Petersburg, and Skagway want the current timber sale program to continue with a mix of management emphases to include other resources. Cities and organizations that want the current timber sale program to continue include: Alaska Loggers Association Inc., City and Borough of Sitka, City of Wrangell - Economic Development Director, Herring Bay Lumber Co., Hoonah City Council, Hull Cutting Co., Ketchikan Chamber of Commerce, Koncor Forest Products Co., Snow Mountain Pine Company, and Western Forest Industry Association.

These individuals and groups believe the Forest Service has an obligation to maintain local and regional economies by continuing the long-term timber sale contracts and the annual timber sales program. They feel that a steady, predictable, long-term timber supply should be assured so that industry can plan its investment strategy. They argue that, in depressed markets, the Forest Service should reduce the costs of timber harvest by maintaining the TTSF and by providing timber sales that are more economically feasible. They feel that a significant amount of the high-value timber stands were removed from timber production by being designated Wilderness through ANILCA. These people believe the TTSF was created by Congress to offset the loss created by Wilderness and National Monument designations and that Congress should fulfill its commitment.

The majority of respondents from Angoon, Auke Bay, Craig, Douglas, Elfin Cove, Gustavus, Kasaan, Klawock, Pelican, Point Baker, Tenakee Springs, and the Lower 48 want the 4.5 billion board feet per decade timber sale program reduced. Cities and organizations sharing this viewpoint include: Alaska Discovery, City of Pelican, City of Port Alexander, City of Tenakee Springs, City of Yakutat, Haida Corporation, Hollis Community Council, Inc., Klawock Cooperative Association, Narrows Conservation Coalition, Sierra Club, Sitka Advisory Committee, Southeast Alaska Conservation Council, Sumner Strait Fish and Game Advisory Committee, The Mountaineers, The Wildlife Society, Wilderness Society, and Yakutat Fishermen's Association.

These organizations believe the long-term contracts should be terminated, that 4.5 billion board feet of timber each decade is more than the Forest is capable of producing, and that the TTSF should not be used to support below-cost timber sales. They believe the large companies dominate the timber sales

program and unfairly compete with small companies who purchase short-term sales. They are concerned that long-term contracts are not flexible enough to address other resource issues or changes in management emphasis. They want to see more emphasis on non-commodity resources than what is given in the current plan.

A number of communities are split in their opinions of managing the Forest to emphasize timber harvest. Half of the respondents want the same mix of emphases. The other half including, Edna Bay, Haines, Juneau, Sitka, Thorne Bay, Wrangell and Yakutat, want less timber harvest.

ISSUE

WHAT ROAD SYSTEM SHOULD BE DEVELOPED ON THE TONGASS NATIONAL FOREST?

The transportation system in Southeast Alaska evolved almost entirely to access logging sites. Today, some of the Forest roads linking island communities have been upgraded and incorporated into the State Highway System; a trend that is expected to continue in the future. In some areas, such as Prince of Wales Island, transportation networks have been developed between some log transfer facilities and existing communities.

The majority of individual respondents from some communities, including, Angoon, Edna Bay, Gustavus, Haines, Ketchikan, Point Baker, Tenakee Springs, Thorne Bay, and from the Lower 48 do not want additional roads, additional log transfer facilities, nor do they want to be connected to other existing roads. They believe that roads and transfer facilities destroy the scenic landscape and the unique characteristics of Southeast Alaska's undeveloped areas. They also believe that access results in concentrated use of and increased competition for fish, wildlife and recreation resources.

Cities and organizations sharing this opinion include: City of Pelican, City of Port Alexander, City of Tenakee Springs, City of Yakutat, Haida Corporation, Sumner Strait Fish and Game Advisory Committee, Yakutat Fish and Game Advisory Committee, and Yakutat Fishermen's Association. City of Yakutat, and Sumner Strait Fish and Game Advisory Committee recommended that some roads be closed following timber harvesting activities. In addition, Yakutat is opposed to having the community connected to Canada by road.

The majority of respondents from other communities, including, Auke Bay, Coffman Cove, Hoonah, Hyder, Juneau, and Sitka, favor additional roads, additional transfer facilities, and encourage connecting existing roads. They point to the need for additional public access for subsistence and recreation use, and to the increased economic opportunities that roads provide. They believe that roads should remain open following timber harvest activities to

provide additional access. They want road alternatives considered that connect Southeast Alaska to Canada. Organizations supporting this opinion include: Alaska Loggers Association, Inc., Alaska State Senate, AMEX Mineral Resources Company, City and Borough of Sitka, City of Wrangell - Economic Development Director, City of Wrangell - Mayor, Ketchikan Area State Parks Advisory Board, Ketchikan Chamber of Commerce, Koncor Forest Products Co., State of Alaska - Office of the Governor, United 4-Wheel Drive Associations, and Whitestone Logging, Inc.

Respondents from Hydaburg, Meyers Chuck, and Port Alexander favor existing road management. Half of respondents from Wrangell want more, while half want less. Respondents from Douglas, Pelican and Petersburg are split between reducing emphasis on road development, and mixing road development with other Forest uses.

ISSUE

WHAT AREAS AND ACCESSABILITY SHOULD BE EMPHASIZED FOR EXPLORATION, DEVELOPMENT, AND PRODUCTION OF MINERAL AND ENERGY RESOURCES?

The Tongass National Forest contains immense mineral resources. Minerals that occur on the Forest range from precious metals to chemical grade minerals. Mining and mineral exploration are not new to Southeast Alaska. In fact, mining activities have occurred for over one hundred years. Juneau, the state capitol, was founded on gold discoveries. Today, along with new explorations, many historical mineral deposits are being revisited. This renewed interest in mining could, directly or indirectly, employ many people in Southeast Alaska.

The majority of individuals responding from Edna Bay, Point Baker, and Wrangell are opposed to emphasizing access for mineral and energy exploration and development. The City of Pelican, City of Port Alexander, City of Tenakee Springs, City of Yakutat, Sumner Strait Fish and Game Advisory Committee, and Yakutat Fishermen's Association are also opposed to emphasizing mineral exploration and development on the Tongass. These individuals and groups believe that mineral resource development will adversely affect other resources, and think that mitigation requirements, established to minimize impacts, do not take place or are not adequately documented. Many suggest that mineral development be discouraged or prohibited in prime fish and wildlife habitat and in Wilderness because they feel protection of fish, wildlife, and Wilderness resources are always more important than mineral resources.

The majority of respondents from Juneau, Hyder, Kasaan, Sitka, and the Lower 48 support more emphasis on access for mineral exploration and development. Organizations sharing this opinion include: AMEX Mineral Resources Company, City and Borough of Sitka, Greens Creek Mining Company, and USDI

Bureau of Mines. Some of these groups and individuals believe the Forest Service does not consider mineral resources equally with other resources in the planning process and that direction is overly restrictive--emphasizing surface resource use and protection, over mineral resource availability and use. This inequity, they suggest, does not truly manifest the multiple-use concept. Some companies commented that their industry requires long-term financial commitments, and that the land base of the Tongass National Forest was too volatile and unstable to invest in mineral exploration and development activities.

Those responding from Craig, Gustavus, Hobart Bay, Hydaburg, Pelican, and other Alaskan communities favor maintaining current management emphasis for mineral exploration and development, and a mix with other Forest uses. Supporting this opinion are Alaska Loggers Association, Inc., Alaska State Senate, City of Wrangell - Economic Development Director, FMC Gold Company, Ketchikan Chamber of Commerce, Koncor Forest Products Co., and the State of Alaska - Office of the Governor.

Respondents from Coffman Cove, Douglas and Petersburg are split three ways in their opinions. Some want more emphasis, others want less, and still others want a mix. Also split in their opinion are respondents from Hoonah. Some are satisfied with current emphasis on minerals, while others want more emphasis. Ketchikan, Port Alexander and other Alaska communities are also split with about half wanting more emphasis and half wanting a mix.

ISSUE

WHAT AREAS AND WHAT AMOUNT OF ROADLESS LANDS SHOULD BE RECOMMENDED FOR WILDERNESS DESIGNATION AND WHAT KINDS OF USES SHOULD BE PERMITTED?

One of the major issues identified in the 1979 Tongass Land Management Plan related to how much land and which areas should be formally designated as Wilderness. Some organizations promoting Wilderness designation considered Alaska to be the Nation's last opportunity to preserve large tracts of lands that were relatively untouched by human activity. To these organizations, formal Congressional designation was seen as the only long-term guarantee that there would be no future major development in these areas. Stressing Alaska's storehouse of minerals and timber, others felt that resource development should be permitted and that Wilderness designation would only 'lock-up' valuable resource development opportunities. Although approximately 5.5 million acres were added to the National Wilderness Preservation System on the Tongass in 1980, the amount and location of Wilderness continues to be an issue.

The majority of individual respondents from Auke Bay, Craig, Douglas, Gustavus, Point Baker, Skagway, Tenakee Springs, Wrangell, and the Lower 48

want additional areas designated as Wilderness. Cities and organizations sharing this position include: City and Borough of Sitka, City of Pelican, City of Tenakee Springs, Klawock Cooperative Association, National Wildlife Federation, Southeast Alaska Conservation Council, Sumner Strait Fish and Game Advisory Committee, Wildlife Society - Alaska Chapter, and Yakutat Fishermen's Association. They want additional areas designated as Wilderness to protect these areas from timber harvest, more roads, and mineral development. They also want motorized access and fish enhancement in Wilderness.

The majority of individual respondents from Ketchikan, Sitka and other Alaska communities want less Wilderness while individuals from Coffman Cove, Hobart Bay, Hoonah, Hydaburg, Klawock, Petersburg, and Thorne Bay want the same amount of Wilderness currently designated.

Opinion was split in the communities of Edna Bay and Haines with about half of the respondents wanting more Wilderness designated and half wanting that currently designated. Likewise, Juneau was split with some wanting more, some less, and some the same.

Other cities and organizations believe there is enough Wilderness and do not want additional areas designated; but, they also want access and use limited in current Wilderness areas to retain pristine characteristics. These include: the City of Wrangell - Economic Development Director, Hollis Community Council, Inc., and the Narrows Conservation Coalition.

Several cities and organizations want fewer areas designated as Wilderness than currently exists. These include: Alaska Loggers Association, Inc., Alaska Miner's Association, Alaska State Senate, AMEX Mineral Resources Company, City and Borough of Sitka, FMC Gold Company, Greens Creek Mining Company, Hull Cutting Company, Ketchikan Chamber of Commerce, Koncor Forest Products Company, Snow Mountain Pine Company, United 4-Wheel Drive Associations, and Whitestone Logging, Inc.

Ketchikan State Parks Advisory Board, City and Borough of Sitka, Whitestone Logging, and the Alaska Loggers Association recommend that portions of existing Wilderness be made available for timber harvest in exchange for other wilderness-like areas.

ISSUE

WHAT WAYS SHOULD NATIONAL FOREST LANDS BE MANAGED TO PROVIDE FOR THE LOCAL LIFESTYLES OF SOUTHEAST ALASKA COMMUNITIES?

Employment and income generated by the government sector, timber, fishing, mining, and tourism industries is critical to the social and economic well-being

of existing and emerging Southeast Alaska communities. Some individuals also rely on subsistence use of Forest resources to provide needed food which is supplemental to their income. In some situations, a positive increase in the development of one industry or lifestyle may negatively affect another.

Dependency on the land and natural resources as part of one's livelihood is an economic fact of life throughout much of Southeast Alaska. Because of this dependency, management of the Tongass National Forest has been, and continues to be, closely tied to the issue of regional and community socio-economic development and structure. Minor changes in Forest programs can sometimes cause major changes in community lifestyles.

Early efforts by the Forest Service to establish a timber processing industry in Southeast Alaska were viewed as a means of promoting stable year-round employment. Since that time however, State land selections authorized by the Alaska Statehood Act of 1959 have resulted in the emergence of numerous remote communities throughout Alaska. The stability and structure of some of these communities is directly influenced by Forest management activities while other communities are not as directly dependent or affected by such activities. Differences in objectives and perceived needs can result in disagreements between some communities and the Forest Service.

As might be expected, views on this issue are divided. The majority of individual respondents from Hoonah and Sitka support emphasizing timber and mining. Several cities and organizations also emphasize development; these include: AMEX Mineral Resources Company, City and Borough of Sitka, Greens Creek Mining Company, Ketchikan Chamber of Commerce, Koncor Forest Products Co., and Whitestone Logging, Inc.

These groups and individuals believe that employment and income generated by the timber and mining industry is critical to the social and economic development of Southeast Alaska. They think that a subsistence lifestyle is impossible without a stable economy based on timber. Several people mentioned that maintaining the present timber sale program of 4.5 billion board feet per decade is needed for community social and economic stability. Many communities believe the timber industry is the only option for employment other than fishing or welfare, and that fishing is not a lucrative business for most people. They think that the jobs provided by timber, both directly and indirectly, have a much higher wage rate than services and retail trade jobs provided by tourism. The latter are viewed as being seasonal jobs, whereas timber and mineral industry employees work year-round. This group did not see any conflicts between logging and mineral development, and the recreation industry. They stated that logging has not hurt wildlife or fish.

A second group of individual respondents from Angoon, Auke Bay, Craig, Douglas, Edna Bay, Gustavus, Pelican, Petersburg, and the Lower 48 want management to emphasize tourism, wildlife, recreation, and subsistence. Cities and organizations including: City of Port Alexander, City of Tenakee Springs, City of Yakutat, Haida Corporation, Hoonah City Council, Juneau Area State Parks/Advisory Board, Juneau Audubon Society, Ketchikan Area State Parks Advisory Board, Sitka State Parks Advisory Board, Sumner Strait Fish and Game Advisory Committee, national chapter of the Wildlife Society, and Yakutat Fishermen's Association support this viewpoint.

These groups and individuals believe there are areas of economic importance other than timber. They feel the economic and social future of Southeast Alaska depends upon the tourism, recreation, and fishing industries. Their opinion is that timber has only short-term social and economic benefits at the expense of long-term gains which can be provided by tourism, recreation, and fishing. They expressed a desire for the Forest Service to help communities switch from a timber economy to a tourist and fishing economy which was viewed as being more compatible with the subsistence lifestyles they wanted. Some communities have opted for tourism development rather than timber and feel the Forest Service should designate key areas for them for undisturbed recreation and subsistence. Their position is that individual communities should prescribe activities in their local area, rather than their being affected by towns dependent on timber.

A third group of individuals commented that a combination of timber, mining, and other commodity industries with tourism, recreation and fishing would be most desirable. Overall, they feel a balance should be sought between preservation and economic development. Individual respondents supporting this management emphasis were from Coffman Cove, Ketchikan, Klawock, Point Baker and Other Alaska communities. Organizations sharing this viewpoint include: Alaska State Senate, FMC Gold Company, Ketchikan Chamber of Commerce, Narrows Conservation Coalition, Snow Mountain Pine Company, State of Alaska - Office of the Governor, Sumner Strait Fish and Game Advisory Committee, and Western Forest Industries Association.

Respondents from Thorne Bay, Wrangell, and Yakutat were split equally with some wanting emphasis on recreation, tourism, and fishing; and others wanting a mix between these and commodity industries. Juneau residents were split between emphasizing timber harvesting, mining, and a mix between these and amenity industries.

APPENDIX B

APPENDIX B

MODELING AND ANALYSIS PROCESS

APPENDIX B

MODELING AND ANALYSIS PROCESS

INTRODUCTION

The purpose of Appendix B is to present a technical discussion of the analysis process and models used in the Revision planning process. Due to the magnitude and complexity of the planning process, a number of analytical models are needed. This discussion includes basic assumptions, modeling components and inputs, rules, methods, and constraints. The information supplements the broader, less technical descriptions included in the body of Chapter 2 of the EIS.

FORPLAN is the primary modeling tool used to assure that land allocations and output schedules for alternatives and benchmarks are made in a way that meets constraints in a cost-efficient manner. In addition to being used to formulate alternatives and benchmarks that are both feasible and cost-efficient, FORPLAN is used to perform detailed accounting work and generate summary reports of information needed to construct the display tables in the EIS.

Two additional models, HCM ad IPASS, are used to generate input data for FORPLAN and estimate the effects resulting from output data. Coefficients for FORPLAN used to estimate effects on wildlife and fish populations were generated using habitat capability models (HCM). HCM is a system for organizing information about wildlife and fish species, their habitats, and relationships between them. This data was used to set Standards and Guidelines, evaluate species and habitat diversity, and identify special habitat needs. An input/output model was built using the IPASS system to estimate income and employment effects resulting from changes in Forest outputs and land allocations. A more detailed description of each of these models is located on page B-109, Other Models.

Neither FORPLAN nor any other model can perfectly represent the "real world;" therefore, results from the modeling process are only approximations of what to expect when alternatives are developed into applied action plans. The objective of modeling is to provide insight and to clarify knowledge; therefore, an approximation is fully adequate to compare alternative management strategies. A choice between alternatives can be made even though the model may lack precision in describing specific attributes of a given alternative.

OVERVIEW

FORPLAN is a specialized matrix generator and report writer for a standard linear programming algorithm (FMPS)[1/]. Linear programming is a mathematical technique for solving simultaneous linear equations subject to a certain set of constraints and a particular objective function. In its simplest form, this is expressed mathematically as:

$$\text{Maximize: } z = c_1x_1+c_2x_2+\ldots c_nx_n \quad \text{(Objective Function)}$$

$$\text{Subject to: } a_1x_1+a_{12}x_2+\ldots a_{1n}x_n\leq b_1$$

$$a_{21}x_1+a_{22}x_2+\ldots a_{2n}x_n\leq b_2 \text{(Constraint set)}$$

$$a_{m1}x_1+a_{m2}x_2+\ldots a_{mn}x_n\leq b_m$$

$$x_j\geq o$$

These mathematical expressions can also be shown in the following matrix:

Column j=1	Column j=2	Column j=3	Column j=n	Constraint Type	Right hand side constraint
Objective function	C_1x_1	C_2x_2	C_3x_3	C_nx_n	Maximize
Row i = 1 (Timber)	$a_{11}x_1$	$a_{12}x_2$	$a_{13}x_3$	$a_{1n}x_n$	$\geq b_1$
Row i = 2 (Land)	$a_{21}x_1$	$a_{22}x_2$	$a_{23}x_3$	$a_{2n}x_n$	$\leq b_2$
Row i = m	$a_{m1}x_1$	$a_{m2}x_2$ xj	$a_{m3}x_3$	$a_{mn}x_n$ $\geq$ o	$= b_m$

$$j = 1,\ldots n$$

The linear equations (rows) represent resource production functions, costs, and acreage or other types of constraints. For example, row 1 might represent acres burned by wildfire. The columns (j=1,n) represent the different activities (prescriptions) that can occur over time on specific units of land called analysis areas (represented by xj). The aij's in the matrix are the production, cost, or resource coefficients associated with each prescription/analysis area combination. The bi's are the right-hand side constraints representing exact amounts of upper ($\leq$) or lower ($\geq$) constraint levels that must be met. In the example above, if row 1 represented timber production, the interpretation of the constraint

$$a_{11}x_1+a_{12}x_2+a_{13}x_3 \ldots +a_{1n}x_n \geq b_1$$

1/ FMPS stands for Functional Mathematical Program System. This is the linear programming code used with FORPLAN on the UNIVAC 1194 at Fort Collins Colorado.

would be that the total amount of timber produced from all prescriptions and analysis areas must be greater than or equal to the amount b_1. With few exceptions, the objective function is to maximize present net value (PNV). Therefore, the cj's are the benefits and costs (PNV) of each prescription.

The FORPLAN model was built by representing the production functions (costs, values, and resource coefficients) for the Forest in the mathematical format described above. The resulting model contained approximately 18,000 columns and 2,000 rows. Once the model was formulated, a number of test runs were made to check for reasonableness and to make calibrations. By altering the objective function and constraint set, the model was able to estimate the resulting costs, benefits, outputs, activities, and land allocations for the particular theme or goal of an alternative or benchmark.

Unique constraint sets were developed to represent management requirements, minimum implementation requirements, specific land allocations, and output schedules for individual alternatives. An iterative process was used to formulate these constraint sets prior to making final FORPLAN runs for the alternatives and benchmarks.

FORPLAN was used to determine the most cost efficient mix of goods and services that could be produced from the Forest given the objectives and constraints of each alternative. The trade-offs among alternatives were examined, and the costs and benefits associated with each objective or constraint were measured. This analysis provided an indirect evaluation of the nonpriced benefits by measuring the amount of present net value (PNV) foregone. The final criterion used to evaluate alternatives was net public benefits (NPB), which is the PNV plus consideration of nonquantifiable Forest resource benefits.

Management activities modeled in FORPLAN were determined by the interdisciplinary team (ID team). This pre-FORPLAN analysis included identifying:

1. The activities that could be applied to the land.

2. The kinds of land to which each activity could be applied.

3. The costs, outputs, and benefits resulting from the application of each activity to a specific type of land.

This method provided the basis for a matrix of all possible management activities that could be modeled and their associated costs, outputs, and benefits.

LAND UNITS

Capability areas are the smallest units of land (or water) for which data is collected in forest planning. They are discrete and recognizable units classified primarily according to physical (soil), biological (vegetation), and issue (wilderness status) factors. All land within a capability area is homogeneous in its ability to produce resource outputs and in its production limitations. The Tongass National Forest has 893,988 capability areas.

Each capability area represents approximately 20 acres. A dot grid was developed by placing a point in the center of each 20 acre cell. The Forest then decided what information was needed for each capability area in order to assess resource opportunities and public issues. This information was collected and entered into the Forest's Geographic Information System (GIS). The point grid was then overlaid with the map information contained in the GIS. The map information under each point was then assigned as an attribute of the point. The map information from 43 different physical, biological, or administrative overlays was assigned to each point. These attributes as determined for each capability area are stored in computer files to form the Forest data base. 2/

Because there were 893,988 capability areas, they could not be used as such in FORPLAN. Use of such a large number of land units would be cumbersome, expensive, and exceed the parameters in FORPLAN. Analysis areas were created to handle this problem. An analysis area is a conceptual aggregate of capability areas that responds in a uniform way to a management prescription.

The delineation of the analysis areas required several steps. First, each resource specialist on the ID team decided which physical or biological attributes in the data base were desired to determine their resource yields. The selection of resource outputs in FORPLAN was guided by the problems identified by the Forest issues, concerns, and opportunities. For example, some attributes were chosen to delineate analysis areas based on spatial differences as related to production cost. Logging operability classes were decided on due to different logging costs associated

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2/ The Forest used the ORACLE Database Management system in conjunction with the ARC/INFO Geographic Information System (GIS). ONce entered into the system, information on capability areas could be retrieved, sorted, aggregated and analyzed.

with timber harvesting. Generally, normal operability classes have less expensive tractor and cable logging available while difficult operability classes require skyline or helicopter yarding, which are more expensive.

Also, large geographic areas were chosen to delineate areas that would require major collector roads for access in addition to local roads and for reporting needs by specific geographic areas.

The analysis areas were next defined using each attribute as a level of stratification (level identifier) in FORPLAN. FORPLAN can accommodate only six level identifiers; therefore, the number of attributes initially selected by the resource specialists was greater than could be used. This forced the ID team to select the most critical attributes needed to address the planning problems and consider the reliability of the data for making yield and cost estimates. The attributes chosen were geographic zones, operability classes, red breasted sapsucker habitat suitability, Sitka black-tailed deer habitat suitability, timber productivity class, marten habitat suitability, black bear habitat suitability, and timber strata. These level identifiers are shown in Table B-1.

Each of these analysis area determinants had two or more sublevels. For example, there were eight vegetation types, four slope classes, seven DBH classes, and seven timber strata. Each analysis area was defined by a unique combination of the sublevels under each level identifier. The Tongass developed 379 analysis areas for use in FORPLAN.

Geographic Zones (geozones) were chosen as a level identifier due to the importance of the geographic location of timber in them determining their value. Geographic location is also important for modeling such items as diversity, viable populations, and cumulative effects. The Forest determined the boundaries of the zones to respond to as many of the issues as possible. These zones conform as closely as possible to Administrative Area boundaries, Ranger District boundaries, roadless areas, existing Wilderness areas, transportation sheds, SEIS analysis areas, and minor harvest unit boundaries. Operability classes were identified to help assess the economic value of timber stands for harvesting. Red breasted sapsucker, Sitka black-tailed deer, black bear, and marten habitat suitability indices were chosen to assist in estimating the effects on these wildlife species due to changes in habitat. Timber productivity was used as a level identifier to account for the different growth rates of timber stands after harvest. Strata was used as a level identifier due to its importance in determining timber volume per acre, wildlife habitat value, and timber harvest economics.

Because there were 379 analysis areas, additional simplification was needed for plan implementation and to provide management direction for geographic areas on the Forest. Management areas were delineated to facilitate plan implementation. The Tongass identified Management Areas as

aggregates of all analysis areas that receive the same management prescriptions. Twenty-three management areas are used for the alternatives. These management areas are mapped or shown for each of the alternatives in the EIS.

PRESCRIPTIONS

A prescription is a management practice and schedule for its application on a specific area. The range of prescriptions describes the possible activities for a given analysis area. FORPLAN determines what should be done given the constraints and objective function for an alternative.

Prescriptions were developed by the ID team to represent the full range of possible management activities. The interdisciplinary team quantified the outputs, costs, and benefits that would occur when a prescription was applied to a given analysis area or land unit. This quantification process produced the output, cost, and benefit coefficients that are used in FORPLAN yield and economic tables. The ID team during their development of prescriptions ensured that the minimum specific management requirements set forth in CFR 219.27 would be met in accomplishing the goals and objectives for the Forest.

TABLE B-1
FORPLAN LEVEL IDENTIFIERS

GEOGRAPHIC ZONE	LOGGING OPERABILITY	RED BREASTED SAPSUCKER (RBS) SITKA BLACK TAILED DEER HABITAT SUITABILITY INDEX	TIMBER SITE PRODUCTIVITY	MARTIN (MTN) & BLACK BEAR (BKB) HABITAT SUITABILITY INDEX	TIMBER STRATA
HYDER	TRACTOR/STANDARD CABLE	RBS HSI= .0 & DEER HSI= .0	HIGH PROD.	MARTIN HSI= .0 & BKB HSI= .0	PLANTATIONS
DUKE ISLAND	ADVANCED CABLE/SUSPENSION	RBS HSI= .0 & DEER HSI= .1	MEDIUM PROD	MARTIN HSI= .0 & BKB HSI= .1	SEEDS/SAPLINGS
REVILLA	ISOLATED STANDS	RBS HSI= .0 & DEER HSI= .2	LOW PROD.	MARTIN HSI= .0 & BKB HSI= .2	POLE TIMBER
CLEVELAND	NON SUITABLE LANDS	RBS HSI= .0 & DEER HSI= .4	NON PROD.	MARTIN HSI= .0 & BKB HSI= .3	YOUNG GROWTH SAWTIMBER
NORTH POW		RBS HSI= .1 & DEER HSI= .0		MARTIN HSI= .0 & BKB HSI= .5	OLD GROWTH STRATA A
SOUTH WEST POW		RBS HSI= .1 & DEER HSI= .1		MARTIN HSI= .0 & BKB HSI= .6	OLD GROWTH STARTA B
CRAIG		RBS HSI= .1 & DEER HSI= .2		MARTIN HSI= .0 & BKB HSI= .7	OLD GROWTH STRATA C/D
DALL ISLAND		RBS HSI= .1 & DEER HSI= .3		MARTIN HSI= .1 & BKB HSI= .0	RIPARIAN, ALL STRATA
OUTER ISLANDS		RBS HSI= .2 & DEER HSI= .0		MARTIN HSI= .1 & BKB HSI= .1	REC PLACES, ALL STRATA
SEA OTTER SOUND		RBS HSI= .2 & DEER HSI= .1		MARTIN HSI= .1 & BKB HSI= .2	OTHER LANDS
BELL ISLAND		RBS HSI= .2 & DEER HSI= .3		MARTIN HSI= .1 & BKB HSI= .3	
MISTY FIORD		RBS HSI= .3 & DEER HSI= .0		MARTIN HSI= .1 & BKB HSI= .4	
SOUTH POW		RBS HSI= .3 & DEER HSI= .1		MARTIN HSI= .1 & BKB HSI= .5	
COR./WARREN/MAURELLE		RBS HSI= .3 & DEER HSI= .2		MARTIN HSI= .1 & BKB HSI= .6	
NORTH KUIU ISLAND		RBS HSI= .3 & DEER HSI= .3		MARTIN HSI= .2 & BKB HSI= .0	
SOUTH KUIU ISLAND		RBS HSI= .4 & DEER HSI= .0		MARTIN HSI= .2 & BKB HSI= .2	
NORTH KUPREANOF ISLAND		RBS HSI= .4 & DEER HSI= .1		MARTIN HSI= .2 & BKB HSI= .3	
MITKOF ISLAND		RBS HSI= .4 & DEER HSI= .2		MARTIN HSI= .2 & BKB HSI= .4	
ZAREMBO ISLAND		RBS HSI= .4 & DEER HSI= .3		MARTIN HSI= .2 & BKB HSI= .5	
ETOLIN ISLAND		RBS HSI= .5 & DEER HSI= .0		MARTIN HSI= .2 & BKB HSI= .6	
WRANGEL ISLAND		RBS HSI= .5 & DEER HSI= .1		MARTIN HSI= .3 & BKB HSI= .0	
FARRAGUT BAY		RBS HSI= .5 & DEER HSI= .2		MARTIN HSI= .3 & BKB HSI= .2	
BRADFIELD		RBS HSI= .5 & DEER HSI= .3		MARTIN HSI= .3 & BKB HSI= .3	
SOUTH KUPREANOF ISLAND		RBS HSI= .5 & DEER HSI= .4		MARTIN HSI= .3 & BKB HSI= .4	
TEBENKOF WILDERNESS		RBS HSI= .5 & DEER HSI= .5		MARTIN HSI= .3 & BKB HSI= .5	
STIKINE LECONTE WILDERNESS		RBS HSI= .5 & DEER HSI= .6		MARTIN HSI= .3 & BKB HSI= .6	
SALT CHUCK WILDERNESS		RBS HSI= .6 & DEER HSI= .0		MARTIN HSI= .3 & BKB HSI= .7	
SMALL STIKINE ISLANDS		RBS HSI= .6 & DEER HSI= .1		MARTIN HSI= .4 & BKB HSI= .0	

TABLE B-1

FORPLAN LEVEL IDENTIFIERS (Continued)

GEOGRAPHIC ZONE	LOGGING OPERABILITY	RED BREASTED SAPSUCKER (RBS) SITKA BLACK TAILED DEER HABITAT SUITABILITY INDEX	TIMBER SITE PRODUCTIVITY	MARTIN (MTN) & BLACK BEAR (BKB) HABITAT SUITABILITY INDEX	TIMBER STRATA
ELFIN COVE/PELICAN		RBS HSI= .6 & DEER HSI= .2		MARTIN HSI= .4 & BKB HSI= .4	
NORTH CICHAGOF ISLAND		RBS HSI= .6 & DEER HSI= .3		MARTIN HSI= .4 & BKB HSI= .5	
WEST CHICHAGOF WILDERNESS		RBS HSI= .6 & DEER HSI= .4		MARTIN HSI= .4 & BKB HSI= .6	
TENAKEE SPRINGS		RBS HSI= .6 & DEER HSI= .5		MARTIN HSI= .4 & BKB HSI= .7	
USHK BAY		RBS HSI= .6 & DEER HSI= .6		MARTIN HSI= .5 & BKB HSI= .0	
CORNER BAY		RBS HSI= .7 & DEER HSI= .0		MARTIN HSI= .5 & BKB HSI= .1	
PLEASENT ISLAND		RBS HSI= .7 & DEER HSI= .1		MARTIN HSI= .5 & BKB HSI= .5	
KELP BAY/HIDDEN FALLS		RBS HSI= .7 & DEER HSI= .2		MARTIN HSI= .5 & BKB HSI= .6	
SITKA		RBS HSI= .7 & DEER HSI= .3		MARTIN HSI= .5 & BKB HSI= .7	
PORT ALEXANDER		RBS HSI= .7 & DEER HSI= .5		MARTIN HSI= .6 & BKB HSI= .0	
WEST CICHAGOF WILDERNESS		RBS HSI= .7 & DEER HSI= .6		MARTIN HSI= .6 & BKB HSI= .1	
SOUTH BARANOF WILDERNESS		RBS HSI= .7 & DEER HSI= .7		MARTIN HSI= .6 & BKB HSI= .4	
TRACY ARM WILDRNESS		RBS HSI= .7 & DEER HSI= .8		MARTIN HSI= .6 & BKB HSI= .5	
ADMIRALITY NATIONAL MON.		RBS HSI= .8 & DEER HSI= .0		MARTIN HSI= .6 & BKB HSI= .6	
ENDICOTT WILDERNESS		RBS HSI= .8 & DEER HSI= .1		MARTIN HSI= .6 & BKB HSI= .7	
RUSSEL FIORD		RBS HSI= .8 & DEER HSI= .2		MARTIN HSI= .7 & BKB HSI= .0	
EXCURSION		RBS HSI= .8 & DEER HSI= .3		MARTIN HSI= .7 & BKB HSI= .5	
MANSFIELD PENINSULA		RBS HSI= .8 & DEER HSI= .4		MARTIN HSI= .7 & BKB HSI= .7	
JUNEAU GOLDBELT		RBS HSI= .8 & DEER HSI= .5		MARTIN HSI= .8 & BKB HSI= .0	
BRABAZON		RBS HSI= .8 & DEER HSI= .6		MARTIN HSI= .8 & BKB HSI= .1	
JUNEAU ICEFIELD		RBS HSI= .8 & DEER HSI= .7		MARTIN HSI= .8 & BKB HSI= .6	
SITUK RIVER		RBS HSI= .8 & DEER HSI= .8		MARTIN HSI= .8 & BKB HSI= .7	
WINDHAM BAY		RBS HSI= .9 & DEER HSI= .0		MARTIN HSI= .9 & BKB HSI= .0	
		RBS HSI= .9 & DEER HSI= .1		MARTIN HSI= .9 & BKB HSI= .7	
		RBS HSI= .9 & DEER HSI= .2			
		RBS HSI= .9 & DEER HSI= .3			
		RBS HSI= .9 & DEER HSI= .4			

TABLE B-1

FORPLAN LEVEL IDENTIFIERS (Continued)

GEOGRAPHIC ZONE	LOGGING OPERABILITY	RED BREASTED SAPSUCKER (RBS) SITKA BLACK TAILED DEER HABITAT SUITABILITY INDEX	TIMBER SITE PRODUCTIVITY	MARTIN (MTN) & BLACK BEAR (BKB) HABITAT SUITABILITY INDEX	TIMBER STRATA
		RBS HSI= .9 & DEER HSI= .5			
		RBS HSI= .9 & DEER HSI= .8			
		RBS HSI=1.0 & DEER HSI= .1			
		RBS HSI=1.0 & DEER HSI= .2			
		RBS HSI=1.0 & DEER HSI= .3			
		RBS HSI=1.0 & DEER HSI= .4			
		RBS HSI=1.0 & DEER HSI= .5			
		RBS HSI=1.0 & DEER HSI= .6			
		RBS HSI=1.0 & DEER HSI= .7			

The Forest distinguishes between FORPLAN prescriptions and Management Area prescriptions. FORPLAN prescriptions are activities that could occur on the analysis areas and are modeled in FORPLAN. They are pure activities that are written without imposition of the Standards and Guidelines needed to fit activities to site-specific conditions. Management Area Prescriptions are written as a result of allocating FORPLAN prescriptions to specific land areas and imposing the Standards and Guidelines. The Management Area Prescription includes the FORPLAN prescription as one of its parts, and it includes additional practices needed to meet Standards and Guidelines at specific sites. Examples of these practices are visual quality objectives and size of clearcuts.

FORPLAN prescriptions were developed to allow consideration of a full range of management activities on the analysis areas. A minimum level prescription was created for each analysis area to allow a choice between selecting the possible intensive practices or selecting no active management practice. Limiting the number of available prescriptions is a constraint. The only criterion used to eliminate timber options concerned technical feasibility. For example, tractor logging was not considered on slopes greater than 60 percent. Other than this criterion of technical feasibility, all timber options were included in the model. The development of timber options was not limited by economic efficiency. No available timber options were eliminated from consideration because they produced a negative Present Net Value (PNV) or even a lesser PNV than some other timber option. A full range of timber options with varying levels of economic efficiency was available to the model. In some alternatives, which will be discussed later, timber options may have even been limited to less efficient choices. A full PNV analysis of all timber options considered is available in the planning record. The FORPLAN prescriptions analyzed are briefly described below. Additional information about these prescriptions and the prescription development process is included in EIS Chapter 2 and in the planning records.

1. PRESCRIPTIONS UNIQUE TO ANALYSIS AREAS

Min Level - Applies minimum custodial direction for all resources to all analysis areas. For the most part, only background outputs occur. There are no associated developed recreation, range, timber, or watershed treatment outputs.

Clearcut without precommercial thinning - Removal of all merchantable commercial trees within a stand in one operation. The stand receives no subsequent precommercial thinning treatment.

Clearcut with thinning - Removal of all merchantable commercial trees within a stand in one operation. The stand receives a subsequent precommercial thin after 15 years.

Selective cutting - Cutting trees with the objective of producing uneven-aged stands with regeneration of desirable species. Trees are harvested singly or in small groups. Primary emphasis is other than timber production.

Group selection - Cutting trees with the objective of producing uneven-aged stands with regeneration. Trees are harvested in small groups (less than 2 acres). Full timber investments are made, including site preparation and planting, to obtain full yields. Primary emphasis is on timber production.

Maintenance - Maintain the existing area in its current status. Includes only sanitation and salvage harvest of dead or dying trees.

Log Transfer Facility (LTF) construction - The construction or reconstruction of LTF's designed to permit transfer of harvested logs into saltwater for haul to a mill site.

2. FORESTWIDE PRESCRIPTIONS

Recreation facility construction - Construction of projects for the express purpose of increasing or enhancing recreation opportunities. New facilities are built and operated at standard levels. These facilities include boat ramps, picnic areas, trailheads, visitor information sites, trails, cabins, campgrounds, and recreation residence tracts.

Fisheries habitat improvement - Activities designed to enhance warm water and coldwater fisheries through both structural and nonstructural improvements.

Wildlife habitat improvement - Manipulation of vegetation for the primary purpose of improving wildlife habitat for both game and nongame species.

The relationship between these FORPLAN prescriptions and the Management Area prescriptions is illustrated in Table B-2. This table displays which FORPLAN prescriptions were used with which Management Area prescriptions. The table provides a comprehensive list of all the FORPLAN prescriptions for each Management Area prescription.

TABLE B-2
RELATIONSHIP OF FORPLAN PRESCRIPTIONS
TO MANAGEMENT AREA PRESCRIPTIONS

MANAGEMENT AREA PRESCRIPTION	APPLICABLE FORPLAN PRESCRIPTION
Wilderness	Min Level
National Monument Wilderness	Min Level
National Monument nonwilderness	Min Level
Research Natural Area	Min Level
Beach Fringe Habitat and Estuary	Min Level
Primitive Recreation	Min Level
Enacted Municipal Watersheds	Min Level
Semi-primitive Motorized Recreation	Min Level
Old-Growth Habitat	Min Level
Experimental Forests	Min Level
Scenic Viewshed	Maintenance
	Clearcut without PCT
	Clearcut with PCT 3/
	Group Selection
	LTF Construction
Visual-Timber	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Group Selection
	LTF Construction
Roaded Natural/Rural Recreation	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Selective cutting
	Group Selection
	LTF Construction
Minerals	Min Level
Wildlife-Timber	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Group Selection
	LTF Construction
Timber-Wildlife	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Group Selection
	LTF Construction
Timber Production	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Group Selection
	LTF Construction
Fish Habitat and Water Quality Requirements	Maintenance
	Selective cutting
Stream and Lake Protection	Maintenance
	Selective cutting

TABLE B-2 (Continued)
RELATIONSHIP OF FORPLAN PRESCRIPTIONS
TO MANAGEMENT AREA PRESCRIPTIONS

MANAGEMENT AREA PRESCRIPTION	APPLICABLE FORPLAN PRESCRIPTION
Special Areas	Min Level
Wild Rivers	Min Level
Scenic Rivers	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Selective cutting
	Group Selection
	LTF Construction
Recreation Rivers	Maintenance
	Clearcut without PCT
	Clearcut with PCT
	Selective cutting
	Group Selection
	LTF Construction

3/ PCT abbreviates precommercial thinning

TIME PERIODS

The basic reporting period to facilitate modeling the schedule of outputs and activities for the 50-year planning horizon (160-years timber horizon) is 10 years. Consequently, outputs are modeled as totals or averages for 10-year periods, and constraints were applied to outputs or activities on a 10-year basis.

OUTPUTS/ACTIVITIES

There are two basic types of outputs/activities that were specified in the FORPLAN model: 1) yield streams of the outputs/activities that cannot be expressed as a function of some other outputs/activities (independent) and 2) outputs/activities that can be expressed as a function of the independant outputs/activities (dependent).

The Tongass FORPLAN model has both independent and dependent yields. These yields are listed below in Table B-3. The table is followed by a brief explanation as to the calculation of how the yield streams were generated and will include the relationship of each of the dependent outputs to the independent outputs. Finally, some outputs were unable to be modeled inside of FORPLAN and so were estimated based on the theme of the alternative and the FORPLAN solution.

TABLE B-3
OUTPUTS/ACTIVITIES TRACKED
INSIDE THE FORPLAN MODEL

Code	Outputs	Units
	TIMBER RESOURCE	
SALE	TIMBER SALE PREPARATION & ADMINISTRATION	MBF
PLNT	REFORESTATION	ACRES
PCTH	PRECOMMERCIAL THINNING	ACRES
MMBF	SOFTWOOD SAWTIMBER FROM NON RIPARIAN AREAS	MBF
TSBF	SOFTWOOD SAWTIMBER FROM RIPARIAN AREAS	MBF
MCF-	SOFTWOOD SAWTIMBER FROM NON-RIPARIAN AREAS	MCF
TSCF	SOFTWOOD SAWTIMBER FROM RIPARIAN AREAS	MCF
TBRW	ALL SOFTWOOD SAWTIMBER	MCF
UTLB	UTILITY VOLUME HARVESTED	MBF
UTLC	UTILITY VOLUME HARVESTED	MCF
LTSY	LONG-TERM SUSTAINED YIELD CONTRIBUTION	MCF
INVN	STANDING TIMBER INVENTORY	MCF
ODSP	ACRES OF OPENINGS (EXISTING)	ACRES
DISP	ACRES OF OPENINGS (FUTURE)	ACRES
9DSP	ACRES OF OPENINGS (EXISTING & FUTURE)	ACRES
	RECREATION/VISUAL RESOURCE	
AA2A	RECREATION OPERATION AND MAINTENANCE	PAOTs
RECP	RECREATION PROJECT CONSTRUCTION	STRUCTURES
RECM	RECREATION PROJECT MAINTENANCE	DOLLARS
EFAL	ACRES VISUALLY DISTURBED (FUTURE)	ACRES
OEFL	ACRES VISUALLY DISTURBED (EXISTING)	ACRES
9EFL	ACRES VISUALLY DISTURBED (EXISTING & FUTURE)	ACRES
9RVD	RECREATION USE	MRVDs
	TRANSPORTATION RESOURCE	
RD-R	ROAD RECONSTRUCTION	MILES
RD-L	LOCAL ROAD CONSTRUCTION	MILES
RD-A	COLLECTOR ROAD CONSTRUCTION	MILES
LTF-	LOG TRANSFER FACILITY CONSTRUCTION	DOLLARS
RD-M	ROAD MAINTENENCE	MILES
HAUL	TIMBER HAULED	MBF

TABLE B-3 (continued)
OUTPUTS/ACTIVITIES TRACKED
INSIDE THE FORPLAN MODEL

Code	Outputs	Units
	FISH RESOURCE	
FSHP	FISH IMPROVEMENT PROJECT CONSTRUCTION	STRUCTURES
FSHM	FISH PROJECT MAINTENENCE	DOLLARS
FSHC	CO-OPERATOR FISH PROJECT CONSTRUCTION	STRUCTURES
COHO	COHO SALMON	SMOLTS
PINK	PINK SALMON	SMOLTS
DOLL	DOLLY VARDEN CHAR	SMOLTS
MMCO	MILLIONS OF COHO	MMSMOLTS
MMPK	MILLIONS OF PINK SALMON SMOLTS	MMSMOLTS
MMDL	MILLIONS OF DOLLY VARDIN CHAR SMOLTS	MMSMOLTS
CCHO	COMMERCIAL COHO SALMON PRODUCTION	MLBS
CPNK	COMMERCIAL PINK SALMON PRODUCTION	MLBS
CSOK	COMMERCIAL SOCKEYE SALMON PRODUCTION	MLBS
CKNG	COMMERCIAL KING SALMON PRODUCTION	MLBS
CDOG	COMMERCIAL CHUM SALMON PRODUCTION	MLBS
OTHF	OTHER COMMERCIAL FISH PRODUCTION	MLBS
SFSH	SPORT FISH	FUDs
	WILDLIFE RESOURCE	
WLDP	WILDLIFE PROJECT CONSTRUCTION	STRUCTURES
WLDM	WILDLIFE PROJECT MAINTENENCE	DOLLARS
CREP	BROWN CREEPER POPULATION CAPABILITY	ANIMALS
WODP	HAIRY WOODPECKER POPULATION CAPABILITY	ANIMALS
SAPS	RED-BREASTED SAPSUCKER POPULATION CAPABILITY	ANIMALS
SQRL	RED SQUIRREL POPULATION CAPABILITY	ANIMALS
MRTN	MARTEN POPULATION CAPABILITY	ANIMALS
EAGL	BALD EAGLE POPULATION CAPABILITY	ANIMALS
BKBR	BLACK BEAR POPULATION CAPABILITY	ANIMALS
BNBR	BROWN BEAR POPULATION CAPABILITY	ANIMALS
OTER	RIVER OTTER POPULATION CAPABILITY	ANIMALS
DEER	SITKA BLACK-TAILED DEER POPULATION CAPABILITY	ANIMALS
HDER	DEER HUNTING	HUDs
HBKB	BLACK BEAR HUNTING	HUDs
BNBR	BROWN BEAR HUNTING	HUDs
HGOS	WATERFOWL HUNTING	HUDs
CPHS	BROWN CREEPER HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
WPHS	HAIRY WOODPECKER HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
MTHS	MARTEN HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
EGHS	BALD EAGLE HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
OTHS	RIVER OTTER HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
BKHS	BLACK BEAR HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
BNHS	BROWN BEAR HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI
DRHS	SITKA DEER HABITAT SUITABILITY INDEX (HSI)	TOTAL HSI

TABLE B-3 (continued)
OUTPUTS/ACTIVITIES TRACKED
INSIDE THE FORPLAN MODEL

Code	Outputs	Units
	LAND ALLOCATION TRACKING	
AC-T	PERIODIC ACRES ALLOCATED TO A PRESCRIPTION	ACRES
AC-A	TOTAL ACRES ALLOCATED TO PRESCRIPTION	ACRES
AC-I	ACRES OF A PRESCRIPTION IMPLEMENTED AT ONE TIME	ACRES

The following is a description of the source of the coefficients for outputs tracked both inside and outside of FORPLAN. A brief discussion of how each coefficient was developed is included here. A more detailed discussion is available in the Forest planning records.

Timber Resource

ACTIVITY: SALE (Timber Sale Prep. and Admin.)
SALE represents the amount of timber that is readied for sale and harvested. The costs of preparing and administering the timber sales are associated with this activity. The volume component of SALE is equal to the sum of outputs MMBF and TSBF. This activity is linked to those FORPLAN prescriptions which include timber harvest.

ACTIVITY: PLNT (Reforestation)
Following a clearcut, the land must be reforested. The number of acres that are regenerated is PLNT. The reforestation occurs naturally soon after harvest. The costs of certification that the stand is reforested are associated with this activity. This activity is linked to those FORPLAN prescriptions which use clearcutting as the final harvest method.

ACTIVITY: PCTH (Precommercial Thin)
A precommercial thin takes place when the stand is 15 years old. The volume thinned is not sold nor does it, in itself, provide financial returns, hence, a precommercial thin. The benefits of the thin are improved stand growth and higher final harvest volumes in the future. The number of acres receiving these thins are tracked within output PCTH. Not all stands are precommercial thinned. This activity is only linked to those FORPLAN prescriptions which include precommercial thinning.

OUTPUT: MMBF and MCF- (Sawtimber from non-riparian areas)
MMBF is timber volume in thousands of board feet and MCF- is the corresponding volume in thousands of cubic feet. These outputs track the timber volume being harvested from all non-riparian areas. These outputs occur when the stand is clearcut. At this time, all volume is removed from the acres arvested and the age of the stand becomes 0 years old. This initiates reforestation and the start of a new rotation cycle.

The existing old-growth tables are by MAPPED volume class derived by running the 1980-85 inventory through SEAPROG - version 27 of the submittal system. The output is net live volume for trees with a DBH of at least nine inches. This volume is based on a 32-foot log scale. Age and MAI values are not valid in uneven-age old-growth.

There are two sets of even-age second growth yield tables. The first is for fully stocked, live gross by Administrative Area, treatment and site index. They were produced from version 28 of the SEAPROG submittal system running seedling/sapling inventory plots without controlling species composition. The other set is empirical, representing expected net volume. It was produced from the first set by application of a flat factor of 11.4 percent (Talor 1934, p.17) less than full stocking, a flat factor of 1.0 percent for breakage, and a variable factor by age for defect derived from figure 8 of Farr, et. al. 1976. No adjustments, other than stocking, were applied for ages less than 70 since no harvest of younger ages is anticipated.

Differences in volume between Administrative Areas for the same treatment and site index is explained by greater diameter growth at lower latitudes, differences in composition, tree value classes, and how the model selects trees to kill when species composition is not controlled. There is variation in volume output between individual plots or stands within sample sets which produced the averages used in the tables.

Varification of SEAPROG has been limited to comparing SEAPROG results with the actual current volumes, etc., on six permanent plots with current ages ranging from 88 to 128 years. Model projections ranged from 25 to 49 years. Percent compared to actual differences ranged from -9 percent to +19 percent for total cubic foot volume but the combined difference was only +0.5 percent. These were all unthinned plots. Refinement of SEAPROG is an ongoing effort and verification of modeled thinning is underway at the present time.

OUTPUT: TSBF and TSCF (Sawtimber from riparian areas)
TSBF is timber volume in thousands of board feet and MCF- is the corresponding volume in thousands of cubic feet. These outputs track the volume being harvested from all riparian areas. Riparian areas are managed with low intensity timber prescriptions in order to minimize the impacts to nearby streams. These yields were calculated by first determining the mix of management activities permitted in riparian areas specified in the Standards and Guidelines. The Standards and Guidelines estimate the mix of /clearcutting/group selection/no harvest/ which can occur in riparian areas. Next, the sustained yield of these activities were derived from the timber yield tables for regenerated stands. A weighted average of the sustained yields were then taken based on the mix of activities specified in the standards and guidelines. This then became the yield for the riparian areas.

OUTPUT: TBRW (All sawtimber harvested)
TBRW is the total volume of all timber harvested in thousands of cubic feet. It is an aggregate of MCF- and TSBF. This output is primarily used for reporting and constraining purposes within the model.

OUTPUT: UTLB and UTLC (Utility volume from timber harvested)
UTLB is utility volume in thousands of board feet and UTLC is the corresponding thousand cubic foot volume. Utility volume is produced with every timber harvest. The proportion of utility to sawtimber volume varies depending on location and productivity of the harvested stand.

OUTPUT: LTSY (Long-term Sustained Yield)
The long-term sustained yield value is internally calculated within FORPLAN and is reported by the output LTSY. Long-term sustained yield is the amount of timber that can be harvested for perpetuity without ever depleting the forest. In essence, the long-term sustained yield volume is equal to annual growth. In formulating this value FORPLAN uses those areas assigned to timber management (harvesting) prescriptions.

OUTPUT: INVN (Inventory)
The volume of standing timber is calculated internally in FORPLAN and is reported by the output INVN. This volume is based on all the acres capable of being assigned a timber emphasis prescription, not only those given a timber prescription.

Recreation Resource

The capacity, demand, and costs of recreation was modeled within FORPLAN. Recreation areas on the Forest have been delineated and these areas produce the recreation capacity and and costs. Projected demand is equated to use as long as it is less than or equal to the amount of capacity. In the event that capacity is less than anticipated demand, use is assumed to equate to demand.

ACTIVITY: AA2A (Recreation Operation and Maintenance)
The capacity of recreation opportunities and their associated cost is calculated and reported as AA2A. The units are in Persons At One Time (PAOT). Capacity for each inventoried recreation place was determined by the Ranger Districts. In the event of logging in an inventoried recreation place, those activities considered to be incompatible with an altered setting were assumed to cease until the area returned to a natural appearing setting. Approximately 50 percent of the current activities occurring in recreation places are reliant upon the natural appearance of the area and hence were assumed to discontinue after logging in a recreation place. The natural appearance of

the area is expected to return after 40 years and is tied to the visual alteration output.

ACTIVITY: RECP (Recreation Project Construction)
Throughout the planning horizon, there are a variety of recreation projects that can be undertaken to provide additional recreation opportunities. If constructed, RECP reports the number of structures and the associated building cost. Construction projects include things such as new trails, cabins, and picnic areas. Each project has a certain number of PAOTs associated with its development. This increase adds the total recreation capacity for the Forest.

ACTIVITY: EFAL 0EFL 9EFL (Visual Disturbance)
The coefficients for the visual alteration output were based on the EFFALT or effective alteration approach. This approach assumes that once an acre of timber is harvested from a visually homogeneous background, it is considered altered to the eye of the average person. This alteration would persist until the trees grew back to a height and color tone that would tend to blend in with the surrounding vegetation. This output was designed to limit the amount of alteration that could exist in a viewshed at one time.

The duration of alteration was estimated to last until the trees had reached a height of 30 feet. This time factor was developed by Forest landscape architects who examined the existing timber plantations at various ages to determine when the alteration was no longer apparent. The length of time until the trees had reached 30 feet was taken from the timber yield tables.

Once the duration of the visual impact is determined, a decay function should be built into the project. The concept of the decay function is that the degree or severity of the visual impact of timber harvest decreases over time. The use of the decay function more accurately reflects reality and correlates more closely with other resource yield tables in FORPLAN. The decay functions were developed by the Region 10 recreation staff and were incorporated into the duration of the output.

ACTIVITY: RECM (Recreation Project Maintenance)
RECM shows the flow of maintenance costs associated with recreation project development. The majority of projects require many years of continued maintenance. These activities may include trail clearing and rebuilding, cabin renovation, and the repainting of recreation-related signs.

Transportation Resource

The majority of road development within FORPLAN is dependent upon timber activities. Most of the roads developed for timber purposes will remain open and usable for hunting and other recreational opportunities.

ACTIVITY: RD-R (Road Reconstruction)
When an existing, but unmaintained, road system is re-utilized for timber harvesting activities it needs to be reconstructed. RD-R is the miles of roads that are reconstructed throughout the planning horizon. This reconstruction is usually done for the purposes of upgrading roads to higher standards for timber harvesting and hauling purposes.

ACTIVITY: RD-L (Local Road Construction)
All new road development is reported in RD-L as miles of road constructed. The amount of roading required to access timber is dependent on the geographical location of the timber stand. The road coefficients were developed based on the number of miles needed to access 1000 acres of suitable timber.

ACTIVITY: RD-A (Arterial and Collector Road Construction)
Suitable timber stands are scattered throughout many large unroaded areas. Since the local road coefficients would only build the roads within the particular pockets of commercial timber, collector road coefficients were developed to connect the local road coefficients into a logical transportation network. Unique coefficients were developed for each geographic zone and allocation pattern unroaded area by looking at the distribution of suitable timber lands and determining the proper collecter roads. When any timber stand in the area is scheduled for harvesting, the entire network of collector roads is scheduled for construction.

ACTIVITY: RD-M (Road Maintenance)
All local and reconstructed roads have an annual maintenance cost. Cost is based on the total miles of road being maintained and recorded in RD-M. This cost is incurred as long as the road exists.

ACTIVITY: LTF- (Log Transfer Facility Construction)
LTF- records the number and costs of construction and reconstruction of log transfers facilities. LTFs are constructed, or reconstructed, for the purpose of loading harvested timber into sea water for transfer to a mill. The number and location of LTFs to be constructed were developed for each geographic zone and allocation pattern unroaded area by looking at the distribution of suitable timber lands and determining the proper LTF needs. When any timber stand

in the area is scheduled for harvesting, the entire network of LTF's is scheduled for construction.

The costs of these LTFs vary depending on the particular site for which it is planned. For example, a steep coastline would cost more than a wide flat beach area. Cost coefficients also depend on the distance the construction equipment must be hauled and how long the LTF will take to construct.

ACTIVITY: HAUL (Timber Hauling)
The amount of timber, in mbf, moved from a landing to a mill is HAUL. The cost coefficients used for HAUL are based on geographic location and the forms of transportation utilized to move the timber (e.g., truck, tug, etc.). All timber is subject to some haul costs. These costs vary greatly over the Forest.

Fish Resource

ACTIVITY: FSHP (Fish Project Construction)
Fish projects include such things as fish ladders and passages, lake fertilization, and stocking. The number and cost of the activities undertaken is FSHP. Each administrative area and management zone has a variety of projects that may be constructed. Each project has a flow of benefits (outputs), usually fish, that are produced. Many projects provide these benefits for several decades following construction.

ACTIVITY: FSHM (Fish Project Maintenance)
The fish projects that involve actual structures (e.g., fish ladders, etc.) usually have an associated maintenance cost. These costs will often continue for the life of the project and may vary over time. The amount of project maintenance over time is FSHM.

ACTIVITY: FSHC (Cooperator Fish Project Construction)
Several of the proposed fish projects will be funded in part by the private donations of individuals and local groups. This expenditure is tracked as FSHC.

OUTPUT: COHO (Coho Salmon Smolt Production)
The number of smolt produced was developed through the Fish Habitat Capability Model discussed later in Appendix B. This smolt production was then linked to the riparian areas identified in the FORPLAN model. The level of smolt production was input for three different prescriptions. These prescriptions are Min Level (no harvest), Stream and Lake Protection, and Fish Habitat and Water Quality.

OUTPUT: PINK (Pink Salmon Smolt Production)
The number of smolt produced was devloped through the Fish Habitat Capability Model discussed later in Appendix B. This smolt production was then linked to the riparian areas identified in the FORPLAN model. The level of smolt production was input for three different precriptions. These prescriptions are Min Level (no harvest), Stream and Lake Protection, and Fish Habitat and Water Quality.

OUTPUT: DOLL (Dolly Varden Char Smolt Production)
The number of smolt produced was devloped through the Fish Habitat Capability Model discussed later in Appendix B. This smolt production was then linked to the riparian areas identified in the FORPLAN model. The level of smolt production was input for three different precriptions. These prescriptions are Min Level (no harvest), Stream and Lake Protection, and Fish Habitat and Water Quality.

OUTPUT: MMCO (Millions of Coho Salmon Smolts)
MMPK (Millions of Pink Salmon Smolts)
MMDL (Millions of Dolly Varden Smolts)

The number of smolts produced annually far exceeds the parameters of FORPLAN's reporting ability. To remedy this, actual smolt numbers are multiplied by a factor of one one-millionth and reported in these units. These numbers are simply duplicates of COHO, PINK, and DOLL, respectively.

OUTPUT: CCHO (Commercial Coho Salmon Production)
To determine the pounds of coho salmon available for commercial harvest a series of conversion factors are used. The first step is calculating the number of coho smolts that survive to adulthood. For coho, the survival ratio is 10 percent.

Coho smolts x 0.10 (survival ratio) = adult coho salmon

Of these adult (commercially valued) coho salmon approximately 75 percent will be harvested by both sport and commercial fishermen.

Adult coho salmon x 0.75 (harvest ratio) = coho harvested

Of these harvested coho 95 percent will have been caught commercially.

Coho harvested x 0.95 (commercial catch) = commercially harvested coho

The number of commercially harvested coho salmon is then multiplied by the average weight of an adult coho. Surveys have indicated that to be a weight of 7.7 pounds. Since the number of commercially harvested coho salmon has been calculated, we can now estimate the total harvest weight.

Commercial coho harvest x 7.7 (pounds per fish) = **Total coho harvest (lbs)**

For reporting purposes, this number is converted to thousands of pounds and reported as CCHO.

OUTPUT: CPNK (Commercial Pink Salmon Production)
To determine the pounds of pink salmon available for commercial harvest a series of conversion factor are used. The first step is calculating the number of pink salmon smolts that survive to adulthood. For pink salmon, the survivability ratio is 1 percent.

Pink smolts x 0.01 (survivability ratio) = adult pink salmon

Of these adult (commercially valued) pink salmon approximately 75 percent will be harvested by both sport and commercial fishermen.

Adult pink salmon x 0.75 (harvest ratio) = pink salmon harvested

Of these harvested pink salmon 95 percent will have been caught commercially.

Pinks harvested x 0.95 (commercial catch) = commercially harvested pinks

The number of commercially harvested pink salmon is then multiplied by the average weight of an adult pink salmon. Surveys have indicated that to be a weight of 3.3 pounds. Since the number of commercially harvested pink salmon has been calculated we can now estimate the total harvest weight.

Commercial harvested pinks x 7.7 (pounds per fish) = **Total pink harvest (lbs)**

For reporting purposes, this number is converted to thousands of pounds and reported as CPNK.

OUTPUT: CSOK (Commercial Sockeye Salmon Production)
To calculate the commercial harvest of sockeye salmon, pink salmon harvest levels are used. On average, total sockeye salmon harvest, in numbers of fish, is 7 percent of the pink salmon harvest numbers. With this information, number of sockeye salmon harvested can be determined since pink salmon harvest numbers have been estimated.

Pinks commercial harvested x 0.07 (sockeye/pink ratio) = sockeyes harvested

The average weight of a commercially harvested sockeye salmon is 6.2 pounds. The total pounds of the sockeye salmon harvest can now be estimated.

Commercial sockeye harvest x 6.2 (pounds per fish) = **Total sockeye harvest (lbs)**

This value is converted to thousands of pounds and reported as CSOK.

OUTPUT: CKNG (Commercial King Salmon Production)
To calculate the commercial harvest of king salmon, coho salmon harvest levels are used. On average, total king salmon harvest, in numbers of fish, is 34 percent of the coho salmon harvest numbers. With this information, number of king salmon harvested can be determined since coho salmon harvest numbers have been estimated.

Cohos commercial harvested x 0.34 (king/coho ratio) = # kings harvested

The average weight of a commercially harvested king salmon is 15.9 pounds. The total pounds of the king salmon harvest can now be estimated.

Commercial king harvest x 15.9 (pounds per fish) = **Total king harvest (lbs)**

This value is converted to thousands of pounds and reported as CKNG.

OUTPUT: CDOG (Commercial Chum Salmon Production)
To calculate the commercial harvest of chum salmon, pink salmon harvest levels are used. On average, total chum salmon harvest, in numbers of fish, is 17 percent of the pink salmon harvest numbers. With this information, number of chum salmon harvested can be determined since pink salmon harvest numbers have been estimated.

Pinks commercial harvested x 0.17 (chum/pink ratio) = # chum harvested

The average weight of a commercially harvested chum salmon is 9.1 pounds. The total pounds of the chum salmon harvest can now be estimated.

Commercial chum harvest x 9.1 (pounds per fish) = **Total chum harvest (lbs)**

This value is converted to thousands of pounds and reported as CDOG.

OUTPUT: OTHF (Other Commercial Fish Production)
This output is produced when certain fish projects are implemented. The majority of fish project outputs are pink and coho salmon. However, many of these projects also produce small volumes of chum, king, and sockeye salmon. For modeling efficiency, chum, king, and sockeye salmon were aggregated into OTHF. This output only occurs with implemented fish projects and is converted and reported in thousands of pounds.

OUTPUT: SFSH (Sport Fishing Production)
Included within the estimated outputs for fish projects was the predicted increased capacity of fish user days (FUDs). SFSH is the number, in thousands, of the anticipated increase in FUDs when fish projects are implemented.

Wildlife Resources

A significant portion of the model development effort was directed to the accurate portrayal of effects on the management indicator species. Management Indicator Species (MIS) are vertebrate or invertebrate species whose population changes are believed to indicate the effects of land management activities (USDA Forest Service 1982). MIS is a planning tool used to promote more effective management of wildlife and fish habitats on National Forest Lands. Through the MIS concept, the total number of species that occurs within a planning area is reduced to a manageable set of species that collectively represent the complex of habitats, species, and associated management concerns. MIS are used to meet the requirements of the National Forest Management Act for maintenance of population viability and biological diversity and to establish management goals for species in public demand. Population viability is the ability of a population to sustain itself naturally.

Three of the 13 MIS were modeled outside of FORPLAN Obtaining the desired wildlife coefficients for the remaining ten involved linking the habitat capability models with the GIS database. The result of running the habitat capability models on the GIS database was the assignment of a habitat suitability index and population estimate to each 20 acre polygon on the Forest for each of 13 MIS. The GIS

database was then used to calculate the average HSI value for each of the 379 analysis areas used in the FORPLAN model. The analysis areas were hooked in the FORPLAN Model to their appropriate HSI value either through level identifiers as in marten, Sitka black-tailed deer, red-breasted sapsucker, and black bear or as analysis area aggregates for bald eagles, river otters, hairy woodpeckers, brown bears, red squirrels, and brown creepers. In this manner every analysis area was defined in terms of its current habitat suitability index. Since the old-growth stands on the Tongass are considered to be in a steady state their HSI's do not change over time unless harvested. Yield tables were then input into FORPLAN depicting this steady state HSI for each old-growth analysis area. Change in HSI after harvest was also calculated using the Habitat Capability Models. This change over time with a reduction in HSI was calculated from the Habitat Capability Models until stands returned to their old-growth condition (approximately 200 years). These regenerated yields for each analysis area and MIS were incorporated into FORPLAN based on their existing HSI. In this manner HSI values developed jointly by the GIS database and the Wildlife Habitat Capability Models for each MIS were included into FORPLAN. Given the average HSI for existing analysis areas, and how they change over time, FORPLAN was able to predict the HSI for each species over time.

The wildlife outputs utilized within FORPLAN are discussed below.

OUTPUT: CPHS (Brown Creeper Habitat Suitability Index)
The value of CPHS indicates the ability of an acre to support brown creepers. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that an acre is incapable of supporting any brown creepers while a 1.0 is considered as optimal brown creeper habitat. Every managed acre has a suitability index number for creepers. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: WPHS (Hairy Woodpecker Habitat Suitability Index)
The value of WPHS indicates the ability of an acre to support hairy woodpeckers. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any woodpeckers, while a 1.0 is considered as optimal woodpecker habitat. Every managed acre has a suitability index number for woodpeckers. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: SSHS (Red-breasted Sapsucker Habitat Suitability Index)
The value of SSHS indicates the ability of an acre to support sapsuckers. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any sapsuckers while a 1.0 is considered as optimal brown creeper habitat. Every managed acre has a suitability index number for sapsuckers. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: SQHS (Red Squirrel Habitat Suitability Index)
The value of SQHS indicates the ability of an acre to support red squirrels. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any red squirrels while a 1.0 is considered as optimal red squirrel habitat. Every managed acre has a suitability index number for squirrels. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: MTHS (Marten Habitat Suitability Index)
The value of MTHS indicates the ability of an acre to support martens. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any martens while a 1.0 is considered as optimal marten habitat. Every managed acre has a suitability index number for marten. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: EGHS (Bald Eagle Habitat Suitability Index)
The value of EGHS indicates the ability of an acre to support bald eagles. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any bald eagles while a 1.0 is considered as optimal bald eagle habitat. Every managed acre has a suitability index number for eagles. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: OTHS (River Otter Habitat Suitability Index)
The value of OTHS indicates the ability of an acre to support river otters. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any river otters while a 1.0 is considered as optimal river otter habitat. Every managed acre has a suitability index number for otters. These

values may vary over time due to management prescriptions and stand ages.

This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: BKHS (Black Bear Habitat Suitability Index)
The value of BKHS indicates the ability of an acre to support black bears. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any black bears while a 1.0 is considered as optimal black bear habitat. Every managed acre has a suitability index number for black bears. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: BNHS (Brown Bear Habitat Suitability Index)
The value of BNHS indicates the ability of an acre to support brown bears. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any brown bears while a 1.0 is considered as optimal brown bear habitat. Every managed acre has a suitability index number for brown bears. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: DRHS (Sitka Deer Habitat Suitability Index)
The value of DRHS indicates the ability of an acre to support Sitka black-tailed deer. The range of values is between 0.0 and 1.0, inclusive. A value of 0.0 means that acre is incapable of supporting any Sitka deer while a 1.0 is considered as optimal Sitka deer habitat. Every managed acre has a suitability index number for deer. These values may vary over time due to management prescriptions and stand ages. This index is then used to determine the carrying capacity (possible population) of that acre.

OUTPUT: CREP (Brown Creeper Habitat Capability)
The potential population (carrying capacity) of brown creepers per acre is CREP. This is the number of creepers that could possibly be maintained successfully on an acre. CREP is capacity, not necessarily the actual creeper population. The ability of an acre to support brown creepers is known by the output CPHS. There exists a linear relationship between CPHS and the potential number of creepers (CREP). It is known that a CPHS value of 1.0 (optimal habitat) is equivalent to a creeper capacity, CREP, of 0.15 creepers per acre (or 96 creepers per square mile). By summing the CREP values for each acre, the brown creeper capacity, CREP, for geozones and the Forest can be estimated.

OUTPUT: WODP (Hairy Woodpecker Habitat Capability)
The potential population (carrying capacity) of hairy woodpeckers per acre is WODP. This is the number of woodpeckers that could possibly be maintained successfully on an acre. WODP is capacity, not necessarily the actual woodpecker population. The ability of an acre to support hairy woodpeckers is known by the output WPHS. There exists a linear relationship between WPHS and the potential number of woodpeckers, WODP. It is known that a WPHS value of 1.0 (optimal habitat) is equivalent to a woodpecker capacity, WODP, of 0.05 woodpeckers per acre (or 32 woodpeckers per square mile). By summing the WODP values for each acre, the hairy woodpecker capacity, WODP, for geozones and the Forest can be estimated.

OUTPUT: SAPS (Red-breasted Sapsucker Habitat Capability)
The potential population (carrying capacity) of sapsuckers per acre is SAPS. This is the number of sapsuckers that could possibly be maintained successfully on an acre. SAPS is capacity, not necessarily the actual sapsucker population. The ability of an acre to support sapsuckers is known by the output SSHS. There exists a linear relationship between SSHS and the potential number of sapsuckers, SAPS. It is known that a SSHS value of 1.0 (optimal habitat) is equivalent to a sapsucker capacity, SAPS, of 0.2094 sapsuckers per acre (or 134 sapsuckers per square mile). By summing the SAPS values for each acre, the sapsucker capacity, SAPS, for geozones and the Forest can be estimated.

OUTPUT: SQRL (Red Squirrel Habitat Capability)
The potential population (carrying capacity) of red squirrels per acre is SQRL. This is the number of squirrels that could possibly be maintained successfully on an acre. SQRL is capacity, not necessarily the actual squirrel population. The ability of an acre to support red squirrels is known by the output SQHS. There exists a linear relationship between SQHS and the potential number of squirrels, SQRL. It is known that a SQHS value of 1.0 (optimal habitat) is equivalent to a red squirrel capacity, SQRL, of 2.0 squirrels per acre (or 1280 squirrels per square mile). By summing the SQRL values for each acre, the red squirrel capacity, SQRL, for geozones and the Forest can be estimated.

OUTPUT: MRTN (Marten Habitat Capability)
The potential population (carrying capacity) of marten per acre is MRTN. This is the number of martens that could possibly be maintained successfully on an acre. MRTN is capacity, not necessarily the actual martin population. The ability of an acre to support martens is known by the output MTHS. There exists a linear relationship between MTHS and the potential number of martens, MRTN. It is known that a

MTHS value of 1.0 (optimal habitat) is equivalent to a marten capacity, MRTN, of 0.0063 martens per acre (or 4 martens per square mile). By summing the MRTN values for each acre, the marten capacity, MRTN, for geozones and the Forest can be estimated.

OUTPUT: EAGL (Bald Eagle Habitat Capability)
The potential population (carrying capacity) of bald eagles per acre is EAGL. This is the number of bald eagles that could possibly be maintained successfully on an acre. EAGL is capacity, not necessarily the actual eagle population. The ability of an acre to support bald eagles is known by the output EGHS. There exists a linear relationship between EGHS and the potential number of eagles, EAGL. It is known that a EGHS value of 1.0 (optimal habitat) is equivalent to an eagle capacity, EAGL, of 0.0406 eagles per acre (or 25 eagles per square mile). By summing the EAGL values for each acre, the bald eagle capacity, EAGL, for geozones and the Forest can be estimated.

OUTPUT: BKBR (Black Bear Habitat Capability)
The potential population (carrying capacity) of black bears per acre is BKBR. This is the number of black bears that could possibly be maintained successfully on an acre. BKBR is capacity, not necessarily the actual black bear population. The ability of an acre to support black bears is known by the output BKHS. There exists a linear relationship between BKHS and the potential number of black bears, BKBR. It is known that a BKHS value of 1.0 (optimal habitat) is equivalent to a bear capacity, BKBR, of 0.0030 black bears per acre (or 1.9 black bears per square mile). By summing the BKBR values for each acre, the black bear capacity, BKBR, for geozones and the Forest can be estimated.

OUTPUT: BNBR (Brown Bears Habitat Capability)
The potential population (carrying capacity) of brown bears per acre is BNBR. This is the number of brown bears that could possibly be maintained successfully on an acre. BNBR is capacity, not necessarily the actual bear population. The ability of an acre to support brown bears is known by the output BNHS. There exists a linear relationship between BNHS and the potential number of bears, BNBR. It is known that a BNHS value of 1.0 (optimal habitat) is equivalent to a brown bear capacity, BNBR, of 0.0039 brown bears per acre (or 2.5 brown bears per square mile). By summing the BNBR values for each acre, the brown bear capacity, BNBR, for geozones and the Forest can be estimated.

OUTPUT: OTER (River Otter Habitat Capability)
The potential population (carrying capacity) of river otters per acre is OTER. This is the number of otters that could possibly be maintained successfully on an acre. OTER is capacity, not necessarily the actual otter population. The ability of an acre to support river otters is known by the output OTHS. There exists a linear relationship between OTHS and the potential number of otters, OTER. It is known that a OTHS value of 1.0 (optimal habitat) is equivalent to an otter capacity, OTER, of 0.0094 otters per acre (or 6 otters per square mile). By summing the OTER values for each acre, the river otter capacity, OTER, for geozones and the Forest can be estimated.

OUTPUT: DEER (Sitka Black-Tailed Deer Habitat Capability)
The potential population (carrying capacity) of Sitka deer per acre is DEER. This is the number of deer that could possibly be maintained successfully on an acre. DEER is capacity, not necessarily the actual deer population. The ability of an acre to support Sitka deer is known by the output DRHS. There exists a linear relationship between DRHS and the potential number of deer, DEER. It is known that a DRHS value of 1.0 (optimal habitat) is equivalent to a deer capacity, DEER, of 0.1953 deer per acre (or 125 deer per square mile). By summing the DEER values for each acre, the Sitka deer capacity, DEER, for geozones and the Forest can be estimated.

OUTPUT: HBKB (Black Bear Hunting Capacity)
The hunting capacity for black bear, HBKB, is calculated from the estimated black bear capacity, BKBR, and recent hunting data. The average sport harvest of black bear, 1980 to 1987, is 396 animals per year. Assuming this harvest level represents 8 percent of the black bear population we can estimate the huntable population. (The 8 percent is the proportion of the population that can be harvested while maintaining a stable population -- reproduction is greater than or equal to 8 percent).

396 harvested / .08 (percent pop. harvestable) = 4950 huntable population

The average number of hunter days (HUDs) for the years 1980 to 1987 is 8420 per year. From this we can calculated the capacity of hunting based on the harvestable black bear population.

8420 HUDs / 4950 huntable pop. = 1.7 hunter days per black bear

This hunter capacity will then be linked to actual hunter demand to determine the economics of black bear hunting.

OUTPUT: HBNB (Brown Bear Hunting Capacity)
The hunting capacity for brown bear, HBNB, is calculated from the estimated brown bear capacity, BNBR, and recent hunting data. The average sport harvest of brown bear, 1980 to 1987, is 133 animals per year. Assuming this harvest level represents 5 percent of the brown bear population we can estimate the huntable population. (The 5 percent is the proportion of the population that can be harvested while maintaining a stable population -- reproduction is greater than or equal to 5 percent).

133 harvested / .05 (percent pop. harvestable) = 2660 huntable population

The average number of hunter days (HUDs) for the years 1980 to 1987 is 4086 per year. From this we can calculated the capacity of hunting based on the harvestable brown bear population.

4086 HUDs / 2660 huntable pop. = 1.5 hunter days per brown bear

This hunter capacity will then be linked to actual hunter demand to determine the economics of brown bear hunting.

OUTPUT: HDER (Sitka Deer Hunting Capacity)
The hunting capacity for Sitka deer, HDER, is calculated from the estimated Sitka deer capacity, DEER, and recent hunting data. The average sport harvest of Sitka deer, 1980 to 1987, is 18,574 animals per year. Assuming this harvest level represents 15 percent of the deer population we can estimate the huntable population. (The 15 percent is the proportion of the population that can be harvested while maintaining a stable population -- reproduction is greater than or equal to 8 percent).

18,574 harvested / .15 (percent pop. harvestable) = 123,826 huntable population

For deer, the hunting capacity will be estimated based on the winter population. A factor of 20 percent is used to determine these winter populations.

123,826 summer pop. / 1.2 (winter ratio) = 103,188 winter deer pop.

The average number of hunter days (HUDs) for the years 1980 to 1987 is 67,225 per year. From this we can calculated the capacity of hunting based on the winter deer population.

67,225 HUDs / 103,188 winter pop. = 0.65 hunter days per Sitka deer

This hunter capacity will then be linked to actual hunter demand to determine the economics of Sitka deer hunting.

ACTIVITY: WLDP (Wildlife Project Construction)
Wildlife projects include such things as grass and clover seeding, and creating canopy gaps. The number and cost of the activities undertaken is WLDP. Each administrative area and management zone has a variety of projects that may be developed. Each project has a flow of benefits (outputs) that are produced. Many projects provide these benefits for several decades following development.

ACTIVITY: WLDM (Wildlife Project Maintenance)
Some wildlife projects require continued maintenance following development. The maintenance will often continue for the life of the project and may vary over time. The amount and cost of project maintenance over time is WLDM.

OUTPUT: WC1C (Wildlife User Days from Projects)
When a wildlife enhancement project is undertaken there is an increase in the capacity of available wildlife user days (WUDs). WC1C is the amount of WUDs, in thousands, produced when these wildlife projects are developed. Not all wildlife projects produce measurable benefits. Projects such as wildlife surveys and deer exclosure study plots do not produce benefits measurable within the structures of the FORPLAN model.

Land Allocation/Implementation Tracking

Several outputs are included in the FORPLAN model to aid in interpreting the prescription allocations.

OUTPUT: AC-T (Acres allocated to a prescription)
The number of acres allocated to a prescription is AC-T. This output reports how many acres have be assigned to be managed by a particular management emphasis.

OUTPUT: AC-A and AC-I (Acres Allocated/Implemented at one time)
These outputs report the actual number of acres subjected to a management activity (e.g., thinning) and at what time (e.g., decade 3) it occurs. The two output function much the same but are link differently to various other aspects of the model.

ECONOMICS IN FORPLAN

Economics are discussed in the alternative development process of Chapter 2 of the EIS and displayed in various tables; Chapter 3 of the EIS describes the economic environment and the economic consequences. Demand analysis for recreation, timber, water, and range is presented in the respective sections Chapter 3. Demand cutoffs are used for both dispersed and developed RVD's.

Most of the economic efficiency analysis was conducted with the use of the FORPLAN model. As part of the analysis process FORPLAN was used to give the maximum discounted net value over the planning horizon of all combinations of analysis areas, prescriptions, and timing choices. This is known as Stage II analysis and it established the rentability of every proposed timber management activity as required by 36 CFR 219.13(b) and FSM 2412.33. Rentability is measured in two ways: soil rent (bare land soil expectation values), and forest rent (current value plus soil rent).

- soil rent varied from $0 to $180 per acre
- forest rent varied from $-5,072 to $3,771 per acre

However, since Stage II analysis considers costs and values only on a per-acre basis, and not in a Forestwide context, it was not used to assign any area as unsuitable or declare any activity as uneconomical. A per-acre analysis does not consider the multiple-use context under which Forestwide benchmarks and alternatives must be formulated. For example, the cost of adding constraints, or the value from relaxing constraints, cannot be considered; therefore, any findings related to whether an area or an activity is uneconomical may not be valid. It is possible that a proposed activity with negative rent values could increase PNV Forestwide if even-flow timber harvest constraints are specified.

Economic data and assumptions incorporated into FORPLAN are described below.

1. Base Year - All dollar values are expressed in 1985 dollars. The following factors based on the implicit price deflator for the gross national product were used to adjust values from other years to 1985.

Year	Factor
1978-85	1.54
1979-85	1.41
1980-85	1.30
1981-85	1.18
1982-85	1.11
1983-85	1.07
1984-85	1.03
1985-85	1.00
1986-85	.97
1987-85	.95
1988-85	.92
1989-85	.88

2. Discount Rate - A discount rate of 4.0 percent was used to determine the present net value of future benefits and costs. This rate approximates the long-term cost of capital in the private sector measured by the return on AAA corporate bonds after adjustment for inflation.

3. Trends - No real price or cost trends for any resource were used in the FORPLAN runs. Costs and prices for all resources were held constant.

4. Cost - All costs used in the analysis are estimates based on accounting records and the experience of project managers. Costs for applying the different resource prescriptions were estimated and built into the economics tables in FORPLAN.

Costs were checked for reasonableness by comparing the first decade costs for the current alternative against actual expenditures for FY 1989. Costs for the current alternative deviated by less than 5 percent from actual expenditures.

The costs used in FORPLAN represent the long-term variable costs rather than the short-term variable costs of producing outputs. The only true fixed costs are minimum level (background) costs. Minimum level costs are all of the costs associated with the minimum level benchmark. All costs above minimum level are treated as variable costs. The costs of FFF are included in PNV calculations but are not subject to budget constraints.

Not all costs, however, were included in the FORPLAN model. The minimum level (background) costs plus other resource costs were not included in the FORPLAN model. Although these costs were not in the model they were manually discounted and included in the PNV calculation. These costs amounted to $12.3 million per year. These costs are associated solely with maintaining the Forest and are not related to any outputs other than background or

incidental outputs. Those costs that were included in the FORPLAN model were those associated with the following resources; recreation, wilderness, wildlife, timber, transportation, and fisheries. The other resource costs included in this figure were associated with programs not tied to any outputs.

5. Benefits - The dollar values for outputs used to calculate PNV are the prices consumers would be willing to pay for Forest outputs, whether or not such prices are actually collected by the federal government. At present it is national policy to provide most Forest outputs either at no charge to consumers or at a charge less than the willingness-to-pay price.

The evaluation of benefits from resource outputs requires a consistent concept of value, although value estimation techniques may vary from resource to resource. For example, timber may be valued using different techniques than minerals or fish, but the concept behind the techniques must be consistent.

For the current Forest plan revision, net willingness to pay is used as the measure of value for forest resource outputs. Net willingness to pay can be simply stated as the total amount one would be willing to pay for a product, minus what they actually have to pay to obtain it. For example, if you valued a product at $15, but had to pay $10 to obtain it, your net willingness to pay would be $15 minus $10 or $5 net. For some outputs, Forest Service fees closely approximate the net willingness to pay value, as in the case of timber stumpage where the value of the end product is first determined, then logging, haul, and manufacturing costs are subtracted to result in the net willingness to pay. For other outputs, such as developed recreation, the fee charged may be less than the net willingness to pay. For still other outputs, such as sport fishing, the Forest Service receives no fee.

Outputs must also be valued at a comparable point in the production process. Resources in the Tongass planning process are valued at the point they leave the Forest.

Wildlife benefits were taken from the 1990 RPA program. These benefits were derived from a study entitled Economic Value of Big Game Hunting in Southeast Alaska by Cindy S. Swanson, Michael Thomas, and Dennis M. Donnelly. This study was a cooperative effort of the Alaska Department of Fish and Game and the USDA Forest Service. The benefit figures in the study were a result of big game surveys conducted in 1984 and 1985 by Alaska Department of Fish and Game. These surveys were analyzed to derive expenditure and net willingness to pay dollar values. The big game species

analyzed includes, Sitka black-tailed deer, mountain goat, and moose. To reduce complexity, the various types of induced wildlife and fish user days (WFUD's) from wildlife improvement projects were modeled and valued as a composite rather than tracked individually in the analysis. The value assigned to the composite was a weighted average of the included WFUD use types, based on historical use patterns.

Recreation benefits were taken from the 1990 RPA program. These recreation benefit figures were derived from a recreation activity survey of visitors to Southeast Alaska which was conducted in 1988 by Data Decision Group, Inc. and the Southeast Alaska Marketing Council. The results were analyzed to derive dollar values for net willingness to pay. Primary activities included sightseeing/flightseeing, local entertainment, hiking/biking, fishing, hunting, water craft use (sailing, canoeing, etc.), and visiting friends or relatives. Net willingness to pay, for all recreation activities, was combined to produce an average value for a composite of activities. This study was a cooperative effort of the Southeast Alaska Marketing Council, Data Decisions Group, Inc. and the USDA Forest Service.

Values for commercial fish were derived from Alaska Department of Fish and Game Data. These data are compiled by the Computer Services Section Staff of the Division of Commercial Fisheries and published annually in the Alaska Catch and Production Commercial Fisheries Statistics Leaflets (Nos. 29 - 38). The commercial fishing industry is the source of all catch and production information for these statistics leaflets. The catch information summarizes the annual fish ticket items. Commercial fisheries businesses who file Alaska Department of Fish and Game fish tickets for all fish caught in Alaska are: 1) the first purchasers of raw fish, 2) each catcher who processed fish, 3) each catcher who exported raw fish, and 4) each catcher who sold to unlicensed buyers (e.g., dockside sales to the general public). An average over the last five years was used to develop the values for planning purposes. No costs were subtracted from the ex-vessel values to arrive at net willingness to pay since it was determined that the majority of the cost of operating the fishing fleet are fixed and do not vary with the amount of harvest. Since the number of vessels and season of harvest are strictly limited by the State of Alaska, there are very few costs which vary with the amount fish caught. Commercial fishermen will incur roughly the same annual costs regardless of the amount of harvests. Therefore, since most of the fishing fleet costs are considered fixed in the short-term they were not subtracted from the ex-vessel values.

The timber benefits used on the Tongass are "net willingness to pay" values as reflected in pond log values assessed at a middle market over a ten-year period minus logging and log

transportation costs. These prices represent net willingness to pay values since they are calculated by taking the price received for logs delivered to the mill and subtracting all of the logging and log transportation costs to arrive at a net timber benefit. A ten year period is used in determining the middle market in order to include periods of both high and low values caused by short-term market fluctuations. Extrapolations were made from this average value to reflect differences in logging operability class, volume class, species composition, and silvicultural system.

The priced values are summarized in Table B-4 along with the actual cash receipts for each output.

In addition to those priced benefits discussed above, there were certain non-priced benefits. Some examples of non-priced benefits are visual quality, old-growth habitat, diversity, research natural areas, wildlife habitat, and primitive areas for recreation. These benefits obviously have a value to society but are presently not quantifiable. These non-priced benefits were handled in the modeling process by the use of constraints. In linear programming constraints have a value of infinity. If a minimum management requirement required a certain output level of a non-priced benefit, it was added as a constraint to the FORPLAN model. If a particular alternative required a specific non-priced benefit output level, it was entered as a constraint. Since these constraints were assumed to have a value of infinity, to assure that the output level was reasonable the tradeoffs in terms of PNV and other resources associated with the production of these non-priced benefits was closely examined and displayed in Chapter III of the EIS.

TABLE B-4
BENEFITS USED IN FORPLAN ANALYSIS
(1985 Dollars)

Output	Unit	Average Actual Cash Receipt per Unit	Average Willingness-to-pay Value Used
Timber			
Even-aged Harvests			
Stikine Area			
Standard Operability			
Strata A	MBF	97.59	97.59
Strata B	MBF	123.86	123.86
Strata C & D	MBF	146.49	146.49
Difficult Operability			
Strata A	MBF	41.88	41.88
Strata B	MBF	88.55	88.55

Strata C & D	MBF	112.07	112.07
Isolated Operability			
Strata A	MBF	-125.28	-125.28
Strata B	MBF	-16.74	-16.74
Strata C & D	MBF	8.81	8.81
Chatham Area			
Standard Operability			
Strata A	MBF	80.33	80.33
Strata B	MBF	106.21	106.21
Strata C & D	MBF	144.68	144.68
Difficult Operability			
Strata A	MBF	23.05	23.05
Strata B	MBF	54.59	54.59
Strata C & D	MBF	117.22	17.22
Isolated Operability			
Strata A	MBF	-148.79	-148.79
Strata B	MBF	-39.84	-39.84
Strata C & D	MBF	34.81	34.81
Ketchikan Area			
Standard Operability			
Strata A	MBF	77.56	77.56
Strata B	MBF	121.64	121.64
Strata C & D	MBF	148.42	148.42
Difficult Operability			
Strata A	MBF	10.34	10.34
Strata B	MBF	87.22	87.22
Strata C & D	MBF	120.60	120.60
Isolated Operability			
Strata A	MBF	-191.31	-191.31
Strata B	MBF	-16.05	-16.05
Strata C & D	MBF	37.12	37.12
Uneven-aged Management			
Stikine Area	MBF	31.88	31.88
Chatham Area	MBF	23.05	23.05
Ketchikan Area	MBF	10.34	10.34
Commercial Fish			
King Salmon	Pound	0.0	2.54
Sockeye Salmon	Pound	0.0	1.65
Coho Salmon	Pound	0.0	1.30
Pink Salmon	Pound	0.0	0.29
Chum Salmon	Pound	0.0	0.55
Recreation			
Recreation/Tourism	RVD	.57	20.10
Hunting			
Deer hunting	Hunter day	0.0	105.18
Black Bear Hunting	Hunter Day	0.0	95.04
Brown Bear Hunting	Hunter Day	0.0	95.04

Demand Cutoffs

Benefit values are applied only where there is a demand for the output by the Forest users. Outputs that exceed demand are given a benefit value of zero, while those that are produced at or below the quantity demanded by consumers are assigned the benefit value described in the previous section. This is handled by the use of a demand cutoff. Most outputs from the Tongass National Forest are consumed in international, national and regional markets where the quantity demanded is many times larger than the productive capacity of the Forest. Demand cutoffs were used for recreation and hunting in order to prevent giving value to the construction of an excessive amount of recreation capacity beyond any expectation of visits by Forest users. Demand constraints were input separately for recreation, deer hunting, brown bear hunting and black bear hunting.

The demand projections discussed above are shown in Table B-5. Demand was considered to be a function of population in the market area for these projections. Several regression equations relating past demand to past population for each activity were tested. The equation that had the highest degree of explanation (R^2) was finally selected for each activity (more complete information on the actual equations is contained in the Economic Analysis portion of the planning records). By coupling these equations with population projections developed by the Bureau of Economic Analysis 1985, the projections of future recreation demand were determined for use as demand cutoffs in FORPLAN.

TABLE B-5
PROJECTED RECREATION AND HUNTING DEMAND
FOR USE AS DEMAND CUTOFFS IN FORPLAN
(Thousands of Visitor Days/Hunter Days)

Decade	Year	Recreation	Deer	Black Bear	Brown Bear
1	1995	2,830.7	83.3	2.6	0.9
2	2005	3,358.1	104.1	3.5	1.1
3	2015	3,762.2	120.0	4.1	1.2
4	2025	3,995.5	128.5	4.5	1.3
5	2035	4,192.7	136.9	4.8	1.4

Constraints

Constraints are restrictions or limits placed on the FORPLAN model to assure that only realistic and/or desired outputs are produced, or land allocations made. In linear programming, constraints always override the objective function (PNV). When constraints for a predetermined level of output, desired physical condition, or allocation are entered as a constraint, it is always achieved (or no feasible solution is found). Output levels and other desired effects entered as constraints are implicitly assumed to have a value of infinity; thus, their cost of production, plus the foregone benefits of any outputs or effects they replace in the solution, is assumed to contribute more to public benefits.

Ensuring that this assumption is reasonable requires carefully documenting such tradeoffs, and in the case of major constraints, displaying the effects on PNV and other resources. To meet these documentation requirements, the Forest used the constraint analysis by subtraction method to analyze and display the impacts of the minimum management requirements, timber policy constraints, minimum implementation requirements, and Forest constraints common to all alternatives. This documentation is displayed in Chapter 3 of the EIS.

There are six different categories of constraints:

1. Technological constraints - These are constraints that make the model work and ensure technical implementability of the results. Technological constraints are applied to all benchmarks and alternatives.

2. Management Requirements (MR's) - These are constraints that meet management requirements or management standards. Procedures for defining the MR's were specified by the planning team. MR's are applied to all benchmarks and alternatives except (FLW) unconstrainted max PNV assigned with flow/LTSY constraints or the (MLV) minimum level of management benchmarks.

   The MR's are taken from 36 CFR 219.27 and generally represent requirements that are outside of Forest Service authority to change. They are based on statutes and regulations in contrast to manual direction or agency policy.

3. Timber policy constraints - These are needed to ensure that timber harvest meets sustained yield, culmination of mean annual increment, and dispersion requirements.

4. Minimum implementation requirements (MIR's) - These are constraints needed to assure that alternatives are minimally acceptable and implementable on the ground. MIR's are within agency control, but there is little

discretionary control regarding their application at the Forest level. MIR's do not apply to benchmarks, but they are applied to all alternatives.

5. Forest constraints common to all alternatives - These constraints are needed to assure plan implementability at the local level. They are based on local (rather than Regional) conditions. These constraints are not applied to benchmarks but are applied to all alternatives.

6. Forest constraints unique to alternatives - These constraints are unique to individual alternatives. They are applied to meet the theme or goal of individual alternatives. Budget constraints, recreation development constraints, land allocations, and scheduled output constraints cause most of the difference between the alternatives.

TECHNOLOGICAL CONSTRAINTS

The following technological constraints were needed to make the model work and ensure technical implementability of the results:

Recreation/Hunting demand cutoffs - These constraints stop the model from valuing RVD's and Hunter Days over the projected demand. These are modeled by setting output limits for each time period such that, when they are exceeded, the benefits are not valued.

MANAGEMENT REQUIREMENTS

The following is a listing of the management requirements, including a discussion of how they were modeled in FORPLAN. By definition, these requirements represent "absolute minimum" constraints. They are:

Capable, Available, and Suitable Timber Lands - During the analysis of the management situation, NFS lands were stratified into two broad categories: (1) lands suitable for timber production; (2) lands not suitable for timber production. Lands were identified as suitable for timber production if they met the following conditions:

1. The land is forested and is currently producing or is capable of producing crops of industrial wood.

2. The land has not been withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

3. Technology and knowledge exist and are available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions.

4. Existing technology and knowledge, as reflected in current research and experience, provide reasonable assurance that adequate restocking can be attained within 5 years after final harvest.

5. Adequate information is available to project responses to timber management activities.

Threatened and Endangered (T&E) Species: Following are the various requirements of T&E species and the corresponding adjustments made in FORPLAN:

1. Emphasize threatened and endangered species habitat protection and improvement in resource management and fire suppression activities (FSM 2670). The species involved include the peregrine falcon and eight species of whales. There are no threatened or endangered fish species found on the Forest.

   The habitat determined to be critical for T&E species will be identified and measures will be prescribed to prevent the destruction or adverse modification of such habitat. Any investments essential to the survival of these species are included in all alternatives.

   This MR was not modeled in FORPLAN. The affected acreage is small, and the Standards and Guidelines ensure this requirement will be met under all alternatives.

2. Provide high and medium capable habitat that is defined in habitat capability models as being sufficient for recovery of threatened and endangered species.

   This MR was not modeled in FORPLAN. The affected acreage is small, and the Standards and Guidelines ensure this requirement will be met under all alternatives.

3. Prevent the destruction or adverse modification of habitat determined to be critical for threatened and endangered species.

   This MR was not modeled in FORPLAN.

Viable Wildlife Populations - A viable population is regarded as one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence. Constraints were entered in FORPLAN for viable populations for 10 of the thirteen management indicator species. The 10 species whose population levels

were entered as constraints were: Sitka Black-Tailed Deer, Brown Bear, Black Bear, Brown Creeper, Red-Breasted Sapsucker, Hairy WoodPecker, River Otter, Rarten, and Bald Eagles.

To insure viable populations, the FORPLAN model was constrained to produce minimum population levels for each of the MIS over time in each geo-zone. The interagency task force first determined the viable population levels for each species for geographic areas appropriate for that particular species. These geographic areas were then either aggregated up or disaggregated down for input into the FORPLAN model geozones depending on the size of the area required for that species' viability. For example, Sitka black-tailed deer viability requires smaller areas than those used in FORPLAN geozones, so their areas had to be combined; brown bear viability required larger areas than those used in FORPLAN geozones, so they had to be disaggregated. The actual viable population levels by geozone were then input into the FORPLAN model as a right hand side constraint by species by geozone. In this manner a well distributed viable population of each MIS was insured. This constraint for viable populations was used in all benchmarks and alternatives. However, the FORPLAN model had to be adjusted after some preliminary runs since some species in some zones were already considered to be below their viable population levels. However, no past harvest activities occurred in these zones so the viable population level was set at the current population level. An example of this was for viable populations of Sitka black-tailed deer on Pleasant Island, Brown creepers in the Coronation Wilderness Area, and marten on Duke Island. These constraints input into all the FORPLAN benchmark runs justify the statement that viable populations are maintained in all benchmarks and alternatives.

Snag-dependent Species - To provide habitat for snag-dependent species, a minimum of 275 snags per 100 acres were maintained within 3rd order watersheds. These snags must be a least 15 inches DBH and ten feet tall. This requirement was not anticipated to significantly affect the production of other resources, hence was not modeled in FORPLAN.

Diversity - A diversity of plant and animal communities was achieved by providing viable populations of all management indicator species which are well distributed throughout the Forest. Diversity is also maintained though dispersal of harvest units, location of leave strips, shape of cut units,use of old-growth Standards and Guidelines plus the existing Wilderness areas. In addition, no type conversion was allowed in any alternative.

In addition to the above a constraint was entered which requires that a minimum of 24 percent of the original amount of old-growth be left in each wildlife analysis area. This constraint was never binding on the solution.

Riparian Areas - Riparian areas were defined as a minimum of 100 horizontal feet distance from all sides of perennial streams, lakes and other bodies of fresh water, or to the recognizable area dominated by associated riparian vegetation, whichever is greater. To determine where the riparian vegetation is located, a combination of soils, plant associations and channel types were used. The area also included very high landslide and erosian hazard areas adjacent to streams and riparian areas for water quality protection. For analysis purposes these acres were estimated by assuming the following:

(a) An 150 feet horizontal buffer around all B3, B5, B8, C1, C3, C6, D3, D4, D5 AND L2 channel types.

(b) An 100 feet horizontal buffer around all remaining channel types.

(c) All riparian soil types which are connected to a stream or lake.

The planning team identified 1.1 million acres of riparian areas outside of existing Wilderness, of which .4 million are tentatively suitable timber lands, to be managed under the principles of multiple-use sustained yield while emphasizing protection of riparian dependent resources.

No practices or prescriptions will be applied to these areas that cause detrimental changes to water quality, aquatic flora and fauna, and/or hydrophytic vegetation within the area.

Timber harvesting, developed recreation, ORV trails, and usage are not considered riparian area dependent, though they are permitted to occur when compatible with riparian dependent resources.

Intermittent and ephemeral channels were acknowledged to be important to riparian areas but were not constrained as part of the MR's. Suitable timber lands within the riparian strip were limited to selection harvest. This means that a range of intensities of vegetation management will be allowed and that a scheduled yield is expected from these areas. The timber yields were estimated to be approximately on a 100-year rotation in these areas and were treated as a separate, noninterchangeable component of the allowable sale quantity.

6. Soil and Water Productivity - This constraint removed approximately 850,000 acres with oversteepened slopes, very high erosion potential, or high instability, from the tentatively suitable land base. No activities were allowed which have the potential to accelerate erosion or mass movement. "Oversteepened slopes" are slopes in excess of the natural angle of repose. Very high erosion potential is defined in Appendix K.

Careful consideration was made to assure that the constraints used to meet the MR's were not compounding. This was done by properly accounting for the overlap between the modeling constraints. The major MR's that were modeled were riparian areas and viable populations for the wildlife management indicator species. The constraints imposed allowed lands to contribute to both riparian and wildlie objectives at the same time. This prevented any double counting of lands needed to meet the management requirements. Thus by properly accounting for the types of overlaps in the MR's as described above it was assured that the MR's were not compounding.

3. TIMBER POLICY CONSTRAINTS

The following is a listing and discussion of timber policy constraints and how they were modeled.

Rotation Age and Culmination of Mean Annual Increment - For benchmarks and alternatives, minimum rotations were based on culmination of mean annual increment measured in utilized cubic feet of merchantable size trees. Mean annual increment is equal to the timber volume in a stand divided by the age of that stand. The largest number produced by this calculation over the life of a stand is called the culmination of mean annual increment. It is the point at which the volume increment of a stand of trees has reached its highest value. Regenerated timber stands were regarded as generally culminated in growth at the age that corresponds to 95 percent of the apparent culmination that was calculated from the managed yield projections used in FORPLAN. Culmination, by definition, will always be later than or equal to the age of merchantability.
Merchantability occurs when the average projected diameter breast height is 9 inches, with a 12 foot log and a 6 inch top. This constraint insures that nearly all trees in the projected stand will be minimally merchantable or larger at first harvest

Table B-6
R10-Assumption: Minimum age for attainment
95 percent of Culmination of Mean Annual Increment
(for standard even-aged management)

AVERAGE SITE INDEX (FARR 50 YR. BASE)	FORPLAN PERIOD	AGE
100	9	90
80	10	100
60	11	110

Sustained Yield Requirements - To ensure that a perpetual timber harvest at the long-term sustained yield level will result by the end of the planning horizon, a constraint was entered. To prevent the model from liquidating the inventory , timber harvest was forced to be greater than or equal to 95 percent of the long-term sustained yield capacity in the last decade. This helped to force the model into a regulated state. Finally, to insure sustained yield, a linkage in FORPLAN was used to insure that harvest is less than or equal to FORPLAN's internally calculated long-term sustained yield.

Harvest Flow Requirements - When nondeclining yield was not applied, harvest flow constraints were used. The primary function of these harvest flow constraints is to maintain a modicum of community stability by preventing erratic flows of timber outputs between periods (i.e., to prevent one period having extremely high outputs and the next period zero outputs). The current allowable sale quantity of 450 MMBF is presently roughly divided into thirds between the Alaska Pulp Coporation, the Ketchikan Pulp Corporation, and the independent sale program. Therefore, 150 MMBF was assumed to be the average volume needed to keep each portion of the sale program in business. The Forest then calculated the percentage of current allowable sale quantity represented by 155 MMBF. This was determined to be 33 percent. FORPLAN was allowed to determine the timber output

for decade 1. In subsequent decades, the timber output was allowed to fluctuate 33 percent (plus or minus) from the previous decade's output. For departure analyses, the timber harvest was forced to return to the base sale schedule after no later than 10 years.

Dispersion - The intent of the dispersion rule is to prevent regeneration units that are still "openings" from being adjacent to each other. The intent is also to disperse units in such a way as to leave logical harvest units between openings for future management. FORPLAN was constrained to allow sufficient acres so that manageable units, at least 5 acres in size, could be left between

regeneration units. Regeneration harvest units (which are considered openings) may, on a case-by-case basis, have up to 15 percent of the periphery in common with other openings. Nonsuitable timber lands were included in the calculation of manageable units. This requirement is in effect until the harvest unit is no longer considered an opening.

An opening created by timber harvesting using even-aged methods was no longer considered an opening once the number of trees defined below have reached 4.5 feet in height and are free to grow.

To model dispersion, each combination of Timber Strata and Administrative Area was constrained to no more than 50 percent of the suitable land every 30 years.

4. **MINIMUM IMPLEMENTATION REQUIREMENTS**

Minimum implementation requirements ensure that alternatives are minimally acceptable and implementable on the ground. Generally the requirements in this category are within agency control, but at the Forest level, there is little discretionary control regarding their application on the ground.

Minimum implementation requirements are common to all alternatives. The three Tongass constraints that make the alternatives acceptable and implementable are 1) maintenance of a 330-foot buffer around bald eagle nests, 2) protection of sensitive plants, and 3) maintaining a non-declining even flow of timber on each Administrative Area of the Forest. Each of these is described below:

1) The Bald Eagle Protection Act dictates that bald eagle habitat will be given special protection. A Memorandum Of Understanding with the U.S. Fish and Wildlife Service and the Forest Service established a minimum 330-foot radius eagle nest zone around each eagle nest tree. Within these eagle nest zones all land use activities which would likely disturb the eagles were prohibited. These lands were removed from the suitable timber base.

2) Candidate sensitive plants will be managed to insure that the species do not become threatened or endangered because of Forest Service actions. This MIR was not modeled in FORPLAN. The affected acreage is small, and the Standards and Guidelines ensure this requirement will be met under all alternatives.

3) A technical operational constraint was imposed to insure that each administrative area of the Forest produced timber on a non-declining sustained yield basis. This constraint was necessary from an

organizational and logistical aspect to insure that the timber sale schedule as estimated could be implemented. Given the size and scale of the Tongass, it would be impossible to shift timber sale operations dramatically from one administrative area of the Forest to another over time.

5. FOREST CONSTRAINTS COMMON TO ALL ALTERNATIVES

Other than those previously described as MR's and MIR's the Tongass had no constraints that were common to all alternatives.

6. FOREST CONSTRAINTS UNIQUE TO ALTERNATIVES

The Forest constraints unique to alternatives are discussed starting on page B-93.

BENCHMARKS

Benchmarks display physical, biological, and technical capabilities. They are not limited by Forest Service policy, budget, discretionary constraints, spatial feasibility, or program and staffing requirements. They are physically and technically, but not necessarily operationally, implementable.

Benchmarks were used as an analytical base for developing alternatives and providing a reference point for comparison with alternatives. The purpose of benchmarks was to explore the resource potential and current situation, and the decision space within which change can or must occur. The benchmarks were also used to display the ability of the Forest to respond to major issues and concerns such as recreation, old-growth, subsistence, and fish.

The following assumptions were made in all benchmarks:

1. Compliance with the management requirements, including prevention of significant or permanent impairment of the productivity of the land.

2. Compliance with a base sale schedule of timber harvest (as described in 36 CFR 219) and scheduling the harvest of even-aged stands generally at or beyond culmination of mean annual increment of growth (as described in 36 CFR 219).

The planning team evaluated the relaxation of both the base sale and harvest, generally at or beyond culmination of mean annual increment. Forest policies and budgets were not constraints. Maximum Present Net Value (PNV) was used as the objective function to obtain the final solution.

The following discussion presents the description, purpose, specifications, and other assumptions of each FORPLAN benchmark analysis made on the Tongass:

(MLV) Minimum Level of Management (backgrounds)

Description and Purpose:

The purpose of this benchmark is to estimate the costs and values of the background outputs which occur regardless of any Forest activities. Minimum level should be thought of as an accounting analysis to determine the residual outputs and fixed costs associated with maintaining the Tongass National Forest. This benchmark is used a base of comparison for other benchmarks. Because it is only an accounting analysis, the phase-in period that would be needed if minimum level were actually implemented is ignored. This benchmark's main purpose is to illustrate which outputs, costs, and values would occur regardless of any management influences, thus later showing those which are actually induced by Forest Service activities.

Specifications:

1. Objective Function: Minimize cost for 150 years.

2. Timber Policies: Not required since no harvest occurs.

3. Landbase: No tentatively suitable lands are available for harvest.

4. Management Requirements:
   a. No riparian requirement.
   b. No viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Only those costs associated with unavoiadable activities are included.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints:
   a. Only background or incidental outputs are allowed.
   b. Timber and developed recreation are set at zero.
   c. Only the dispersed recreation use that cannot be discouraged or controlled will occur.

8. Activity Constraints:
   a. No timber harvesting is permitted.
   b. All developed recreation facilities are closed.
   c. No watershed, fisheries, or wildlife improvement projects are allowed.
   d. State and county roads will remain open but most Forest roads will be closed.
9. Budget Constraints: None.

(FLW) Unconstrained MAX PNV Assigned with Flow/LTSY Constraints

Description and Purpose:

The purpose of this benchmark is to show the the most economically efficient level of resource production with the fewest possible constraints. It also forms the base run which will be used in evaluating the trade-offs associated with the management requirements (MR's). The only restriction in this benchmark is a maximum harvest fluctuation of 33 percent per decade and a sustained yield requirement to guarantee enough ending timber inventory to sustain the harvest. Given those two restrictions, this benchark displays the maximum present net value and the associated outputs that can be produced regardless of the impacts on other resources. It thus illustrates an economically efficient level of valued resources with the fewest constraints.

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policy Constraints:
   a. Minimum rotation: merchantability
   b. Sustained yield requirements
   c. Minimum harvest flow requirements (33 percent change between decades)
   d. No dispersion

3. Landbase: all tentatively suitable lands available.

4. Management Requirements:
   a. No riparian requirement.
   b. No viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(PNV) MAX PNV Assigned with MR-NDY-CMAI

Description and Purpose:

This benchmark defines and evaluates the management requirements. It shows the opportunity cost of all the MR's taken collectively when compared to the FLW benchmark. Then, when additional constraints are imposed, this benchmark displays the opportunity costs of those additional constraints. It estimates the mix of resource uses and provides a schedule of outputs and costs that will maximize the PNV of those outputs that are assigned a monetary value, subject to meeting MR's. Dollar values are based on actual or simulated market prices (willingness-to-pay) for timber, recreation, fish, and wildlife

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) are used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: all tentatively suitable lands available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(MKV) MAX PNV - Market Values Only - With MR-NDY-CMAI

Description and Purpose:

This benchmark estimates the mix of resource uses and provides a schedule of outputs and costs which maximizes the present net value of those outputs that have established market values. The values were removed from the non-market resources for the formulation of this benchmark. Only those values for timber, commercial fish, and developed recreation were allowed to affect the land allocations and output production levels.

Specifications:

1. Objective Function: MAX PNV with market values for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) are used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: all tentatively suitable lands available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for market resources (timber, developed recreation, and commercial fish) are the only ones used to determine the solution.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.
   e. The solution is then run through the FORPLAN report writer to price out all assigned values. The values from the second report will be used to make comparisons.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(TBR) Max Timber for 1 Period with NDY-CMAI-MR's</u>

Description and Purpose:

This benchmark defines the maximum timber output possible for the first decade under current policy and management requirements. If no other resources mattered beyond their minimum tolerable level, this benchmark indicates the maximum timber that could be sustained without economic considerations.

Specifications:

1. Objective Function: <u>MAX timber</u> for 1 period.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) were used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the timber harvest levels for the first 5 periods defined in the base run run.

   The specifications for this rollover are the same as the base run with the following exceptions:

   a. Objective Function: <u>Maximize PNV</u> for 15 periods.

   b. Output Constraint: Meet timber outputs from the first period as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.
9. Budget Constraints: None.

(TBD) Max Timber for 1 Period with management requirements, Culmination of Mean Annual Increment, But Without Non-Declining Yield

Description and Purpose:

This benchmark defines the maximum timber output possible for the first decade under current policy and management requirements, but without non-declining yield. When compared to TBR, it illustrates how binding the NDY constraint is on timber production. Its results describe the maximum amount of additional timber production that could be achieved under a departure from NDY.

Specifications:

1. Objective Function: MAX timber for 1 period.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) were used.
   b. Sustained yield requirements.
   c. Minimum harvest flow requirements (33 percent change between decades)
   d. Dispersion.

3. Landbase: all tentatively suitable lands available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.
   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the timber harvest levels for the first period defined in the base run run.

   The specifications for this rollover are the same as the base run with the following exceptions:

   a. Objective Function: Maximize PNV for 15 periods.

   b. Output Constraint: Meet timber outputs from the first period as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(TBC) Max Timber for 1 Period with Management Requirements, Non-Declining Yield, But Without Culmination of Mean Annual Increment</u>

Description and Purpose:

This benchmark defines the maximum timber output possible for the first decade under current policy and management requirements, but without culmination of mean annual increment. When compared with TBR it illustrates how binding the CMAI constraint is on timber production. If no other resources mattered beyond their minimum tolerable level, this benchmark indicates the maximum timber that could be sustained without economic considerations or requiring harvest to occur after culmination.

Specifications:

1. Objective Function: <u>MAX timber</u> for 1 period.

2. Timber Policies:
   a. Minimum rotation: merchantability
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: all tentatively suitable lands available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the timber harvest levels for the first period defined in the base run run.

   The specifications for this rollover are the same as the base run with the following exceptions:

   a. Objective Function: <u>Maximize PNV</u> for 15 periods.
   b. Output Constraint: Meet timber outputs from the first period as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(WLN) Max PNV with Maximum Wilderness

Description and Purpose:

This benchmark is designed to evaluate the impacts of maximum Wilderness allocations. All lands meeting the roadless area criteria are allocated to Wilderness management. No boundary adjustments are allowed; the largest unroaded areas will be used. When compared to PNV, it illustrates the impact of sending all potential areas to Wilderness.

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) were used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase:
   a. All defined roadless areas are allocated to wilderness prescriptions.
   b. All remaining tentatively suitable lands are available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(NON) MAX PNV with No Roadless Areas to Wilderness

Description and Purpose:

The purpose of this benchmark is to evaluate the impacts of no additional Wilderness allocations. All roadless areas will be allocated to non-Wilderness management prescriptions. When compared to PNV, the impacts of sending no additional acres to Wildernesss are illustrated.

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase:
   a. All tentatively suitable lands.
   b. All defined roadless areas are allocated to non-Wilderness prescriptions.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(FSH) MAX Anadromous Fish Production for 15 Periods (150 Years)</u>

Description and Purpose:

This benchmark defines the maximum capability of the Forest to produce anadromous fish over the planning horizon, subject to management requirements. It also illustrates what other resource production levels are consistent with the maximum fish production level.

Specifications:

1. Objective Function: <u>MAX Fish Production</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) were used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the fish production levels for the first 15 periods defined in the base run run.

   The specifications for this rollover are the same as the base run with the following exceptions:

   a. Objective Function: <u>Maximize PNV</u> for 15 periods.
   b. Output Constraint: Meet fish production outputs over the first 15 periods as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(RCR) MAX Recreation Use for 15 Periods (150 Years)

Description and Purpose:

This benchmark defines the maximum capability of the Forest to provide recreation use over the planning horizon, subject to management requirements. It also illustrates what other resource production levels are consistent with the maximum recreation use level.

Specifications:

1. Objective Function: Maximize Recreation Use for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the recreation use levels over 15 periods defined in the base run.

   The specifications for this rollover are same as the base run with following exceptions:
   a. Objective Function: Maximize PNV for 15 periods.
   b. Output Constraint: Meet recreation use outputs from each of the first 15 periods as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.
9. Budget Constraints: None.

<u>(WUD) MAX old-growth Wildlife Habitat for 15 Periods (150 Years)</u>

Description and Purpose:

This benchmark illustrates what resource production levels are possible if the reduction of habitat for old-growth dependent species is limited to one percent. It also defines the maximum capability of the Forest to provide wildlife related use (subsistence, hunting fishing, viewing etc.) over the planning horizon, subject to maanagement requirement.

Specifications:

1. Objective Function: <u>Maximize old-growth Habitat</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. A rollover is required to determine the most economically efficient allocation and other resource outputs which can still be produced while meeting the old-growth habitat levels for the first 15 periods defined in the base run run.

   The specifications for this rollover are same as the base run with following exceptions:

   a. Objective Function: <u>Maximize PNV</u> for 15 periods.
   b. Output Constraint: Meet old-growth wildlife habitat outputs over the first 15 periods as defined by the base run.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

(CUR) Current Level

Description and purpose: This benchmark estimates the effects of maintaining the current level of outputs and services in the future with the continuation of the existing land allocations, direction, policies, and practices. This alternative was designed to accurately depict the current operating program on the forest.

Specifications:

1. Objective Function: MAX PNV for 15 periods.
2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land currently in a LUD III or LUD IV.

4. Management Requirements:
   a. Minimum riparian requirement (Prescription #13)
   b. Viable population requirement for each of 50 Geographic Zones for each MIS for 15 decades.

6. No rollover is required.

7. Output Constraints:
   a. 4.5 BBF decadal harvest floor.
   b. No more that 50 percent of the ASQ in the first decade could come from high volume old-growth.
   c. At least 7 percent of the ASQ in all decades had to come from difficult harvesting areas (long span skyline and access limited).
   d. None of the ASQ could come from isolated timber stands.

8. Activity Constraints:
   a. No harvest in 330-foot inventoried eagle nest buffers
   b. Limited visual disturbance in LUD III.
   c. No harvest in any LUD III special (yellow cross-hatched areas on the current LUD map).
   d. No more than 63,000 acres/decade of second growth can be precommercially thinned.

9. Budget Constraints: None

(GRP) Group Selection

Description and Purpose:

The purpose of this benchmark is to manage all lands previously available for even-aged management under group selection. This benchmark defines maximum timber output economically possible under group selection (<2-acres) on all lands suitable for timber management subject to MR's. When compared to the PNV run it displays the change in outputs, effects, and costs associated with using a group selection harvest system rather than clearcutting.

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion not required since no openings are created.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: Timber harvesting limited to group selection.

9. Budget Constraints: None.

<u>Constraint Analysis</u>

The purpose of constraint analysis is to display the cost of each of the imposed management requirements. The following benchmarks are designed to illustrate the trade-offs associated with the management requirements, including non-declining yield, culmination of mean annual increment, dispersion, viable populations, and riparian protection. The constraint analysis benchmarks involve the removal of one of the management requirement constraints from the PNV benchmark to determine the actual impact of that management requirement. That analysis displays only the marginal impact of that constraint and not that portion caused by the overlap with other constraints remaining in the model formulation. That management requirement is then reinstated into the model and a different one is then removed. The process is repeated until all of the management requirements have been analyzed. This constraint analysis process gives a good indication of the signifivant constraints and aids in focusing on the most important constraints. The following section displays the specifications for each of the constraint analysis benchmarks.

(NDY) Management Requirement Benchmark Without Non-Declining Yield.

Description and Purpose:

The purpose of this benchmark is to display the proportion of the opportunity cost associated with the management requirements that can be attributed to the non-declining yield policy constraint. This benchmark is a duplicate of the PNV benchmark except the non-declining yield constraint has been removed. When compared to the FLW and PNV benchmarks the NDY run displays how much of the total reduction in present net value caused by the management requirements can be associated with the non-declining yield constraint.

Specifications:

1. Objective Function: MAX PNV for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Minimum harvest flow requirements (33 percent change between decades)
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No Rollover is required,

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(CMI) Management Requirement Benchmark Without Culmination of Mean Annual Increment (CMAI).</u>

Description and Purpose:

The purpose of this benchmark is to display the proportion of the opportunity cost associated with the management requirements that can be attributed to the CMAI constraint. This benchmark is a duplicate of the MR benchmark except that the CMAI constraint has been removed. When compared to the FLW and PNV benchmarks the CMI run displays how much of the total reduction in present net value caused by the management requirements can be associated with the CMAI constraint.

Specifications:

1. Objective Function: <u>MAX PNV</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: merchantability.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(VPD) Management Requirement Benchmark Without Maintaining Viable Populations.</u>

Description and Purpose:

The purpose of this benchmark is to display the proportion of the opportunity cost associated with the management requirements that can be attributed to the vaible populations constraint. This benchmark is a duplicate of the PNV benchmark except the viable populations constraint has been removed. When compared to the FLW and PNV benchmarks the VPD run displays how much of the total reduction in present net value caused by the management requirements can be associated with the viable populations constraint.

Specifications:

1. Objective Function: <u>MAX PNV</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. No viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(RIP) Management Requirement Benchmark Without Riparian Protection.</u>

Description and Purpose:

The purpose of this benchmark is to display the proportion of the opportunity cost associated with the management requirements that can be attributed to the riparian constraint. This benchmark is a duplicate of the MR benchmark except the riparian constraint has been removed. When compared to the FLW and MR, benchmarks the RIP run displays how much of the total reduction in present net value caused by the management requirements can be associated with the riparian constraint.

Specifications:

1. Objective Function: <u>MAX PNV</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. Dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. No riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

<u>(DSP) Management Requirement Benchmark Without Dispersion of Harvest Units.</u>

Description and Purpose:

The purpose of this benchmark is to display the proportion of the opportunity cost associated with the management requirements that can be attributed to the dispersion constraint. This benchmark is a duplicate of the PNV benchmark except the dispersion constraint has been removed. When compared to the FLW and PNV benchmarks the DSP run displays how much of the total reduction in present net value caused by the management requirements can be associated with the dispersion constraint.

Specifications:

1. Objective Function: <u>MAX PNV</u> for 15 periods.

2. Timber Policies:
   a. Minimum rotation: The full set of rotation ages greater than or equal to 95 percent of culmination of mean annual increment (CMAI) was used.
   b. Sustained yield requirements.
   c. Nondeclining yield requirement.
   d. No dispersion.

3. Landbase: All tentatively suitable land available.

4. Management Requirements:
   a. Minimum riparian requirement.
   b. Minimum viable population requirement.

5. Economic Assumptions:
   a. Net willingness to pay values for timber, wildlife, recreation, commercial fish, and sport fish.
   b. Costs as determined by Forest unit cost study.
   c. No value or cost trends for outputs or activities.

   d. Demand cutoffs for RVD's and WFUD's are used.

6. No rollover is required.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

7. Output Constraints: None.

8. Activity Constraints: None.

9. Budget Constraints: None.

BENCHMARK RESULTS

The following discussion describes the information provided by the analysis of each benchmark. Table B-7, following the description of the benchmarks, displays the outputs, cost, and present net value (PNV) of each benchmark.

<u>(MLV) Minimum Level of Management</u>

This benchmark results in all commodity outputs on the Forest being reduced to zero (including timber, commercial fish, developed recreation, and minerals). All public and private sector developed recreation facilities on National Forest lands are closed and allowed to deteriorate. Wilderness areas will not be administered or maintained. Their trail structure will be allowed to deteriorate and the only use that will continue to occur will be uninduced dispersed recreation. Dispersed recreation use that cannot be discouraged or controlled will continue to occur. State roads will remain open but most Forest roads will be closed. Cultural resource management would be at a minimum and would be primarily for the protection of cultural properties (especially in conjunction with minerals management or unauthorized recreation activities).

Vegetation will follow natural succession. Habitat capability for management indicator species requiring old-growth habitat will stabilize over time. The timber program would be discontinued. All road development would be halted. The soil and watershed conditions will return to their natural state. Every subsequent benchmark and alternative must at least produce the same outputs as this minimum level benchmark.

<u>(PNV) MAX PNV Assigned with MR-NDY-CMAI</u>

Some of the significant findings from this benchmark which illustrate the most economic solution for the Forest are listed below:

a. The timber harvest level is 580 MMBF annually in the first decade. This is a 29 percent increase over the ASQ in the current Forest plan.
b. The long-term sustained yield capacity of the Forest is 1,510 MMBF annually. This indicates the long-term timber production capability of the Forest is significantly higher than present harvest levels due to the anticipated growth rates on second growth stands.
c. Reforestation is 22,200 acres per year in the first decade. This is a 31 percent increase over the current level. This rate of reforestation will result in 118,300 acres of additional second growth stands over 50 years.
d. No harvest will occur in riparian areas.

f. 200 miles of new roads will be constructed per year during the first decade. All total, 2,000 miles will be constructed during the next 10 years and 10,500 miles during the next 50 years.
g. Recreation and tourism capacity is maintained at 4.2 million visitor days per year in the first decade. Recreation use is anticipated to be 2.8 million visitor days per year during that same time period. This will result in excess capacity of 1.4 million visitor days during the next ten years.
h. Recreation and tourism capacity will continue to be maintained at 4.2 million visitor days per year in the fifth decade. Recreation use is anticipated to also be 4.2 million visitor days per year during that same time period. This will result in no excess capacity being available after 50 years.
i. Brown bear habitat will be reduced less than 1 percent after the first decade and only 4 percent over the next fifty years.
j. Bald eagle habitat will be reduced 3 percent after the first decade and 32 percent over the next fifty years.
k. Sitka black-tailed deer habitat will be reduced 6 percent after the first decade and 30 percent over the next fifty years.
l. Brown creeper habitat will be reduced 18 percent after the first decade and 47 percent over the next 50 years.
m. Black bear habitat will be reduced less than 1 percent after the first decade and 16 percent over the next 50 years.
n. Marten habitat will be reduced 2 percent after the first decade and 20 percent over the next 50 years.
o. Red breasted sapsucker habitat will be reduced 4 percent after the first decade and 20 percent over the next 50 years.
p. Hairy woodpecker habitat will be reduced 8 percent after the first decade and 34 percent over the next 50 years.
q. River otter habitat will be reduced 4 percent after the first decade and 29 percent over the next 50 years.
r. Red squirrel habitat will be reduced 2 percent after the first decade and 34 percent over the next 11 years.
s. Salmon habitat will increase for all species over the base year. This increase is due to fisheries improvement projects and results in a 10 percent change from the base year level.
t. Populations of sport fish will remain at sufficient levels to meet the anticipated demand for sport fish.
u. Wildlife populations will remain at sufficient levels to meet the anticipated demand for hunting.

v. 900,000 acres of roadless will be maintained in a natural condition, when existing Wilderness areas are included this results in a total of 6.3 million acres being managed for non-comodity resources.
w. The total Forest Service budget needed to implement the benchmark will be $89 million.

<u>(MKV) MAX PNV with Market Values (Management Requirements and Timber Policy Constraints Only)</u>

The significant findings from this benchmark are listed below:

a. Timber harvest levels increase 10 MMBF from the maximum present net value benchmark. This indicates that non-market resource values do not significantly affect timber harvest levels.
b. No harvest occurs in riparian areas due to the high commercial fish values relative to the net value of timber harvesting.
c. Recreation capacity and use will not change significantly from the maximum present net value benchmark. This indicates that non-market resource values do not have a large impact on the level of recreation and tourism production.
d. Wildlife populations decline at approximately the same rate as in the maximum present net value benchmark. This indicates that non-market resource values do not significantly affect the economics associated with the production of wildlife.
e. Commercial fish are produced at their maximum level since they are considered a market resource.
f. Hunting and fishing are still produced at levels sufficient to meet demand even though the resources are not valued in this benchmark. This indicates there is little economic competition between the production of market resources and hunting and fishing.
g. 5.8 million acres will be managed to maintain their natural setting. These total acres are less than the maximum present net value benchmark results thus indicating that the inclusion of non-market values may influence development decisions.

(TBR) MAX Timber for 1 Period (Management Requirements and Timber Policy Constraints)

Some significant findings from this benchmark are listed below:

a. The maximum timber production level subject to management requirements and timber policy is 780 MMBF per year in the first decade.
b. The maximum long-term sustained yield of the Forest subject to management requirements and timber policy constraints is 1,950 MMBF per year. This is much higher than the short-term harvest levels due to the existing age class distribution (predominantly older stands) and the anticipated growth rates on regenerated timber stands.
c. This maximum timber production level will require an increase in reforestation from 17,000 acres per year to almost 26,000 acres per year in the first decade.
d. 50 MMBF of timber will be harvested from riparian areas.
e. The maximum amount of timber harvest still produces enough recreation capacity to meet anticipated demand over the next 50 years.
f. The decline in wildlife habitat is accelerated over the amounts listed in the maximum present net value benchmark due to the increased rate of timber harvest. This additional amount of habitat reduction generated by the increased harvest of 200 MMBF ranges from 4 percent for black bears to 9 percent for bald eagles.
g. The maximum level of timber production will not have any significant change in salmon production due to restrictions on the type of harvest which may occur in riparian areas. Fish production increases since improvement projects, which enhance fish habitat, do not compete with timber production.
h. The harvest levels in this benchmark will produce adequate wildlife and fish populations to meet the anticipated demand for hunting and sport fishing.
i. No additional acres will be managed to maintain their natural setting.
j. This benchmark will require a Forest Service budget of more than $139 million per year for the next decade.

(TBD) MAX Timber for 1 Period (TBR Benchmark, Less Non-declining Yield)

The significant findings from this benchmark are listed below:

a. A departure from non-declining yield can increase the maximum annual timber production in the first decade from 780 MMBF to 1,150 MMBF. This is an increase of almost 50 percent.

(TBC) MAX Timber for 1 Period (Benchmark 5, Less Culmination of Mean Annual Increment)

Significant findings from this benchmark are listed below:

a. Removal of the requirement not to harvest timber until they have reached 95 percent of mean annual increment will increase the maximum timber harvest level in the first decade from 780 MMBF per year to 850 MMBF, or 9 percent.

(WLN) MAX Wilderness

Findings from this benchmark are listed below:

a. A 150 MMBF allowable sale quantity can be produced in the first decade from lands not meeting the criteria for Wilderness consideration.
b. Road construction is reduced to 40 miles per year in the first decade. These roads will only be constructed in areas not suitable for Wilderness consideration.
c. The decline in all wildlife species is greatly reduced. The declines over the next 50 years range from 2 percent for the red squirrel to 14 percent for the brown creeper.
d. There will be a slight increase in recreation and tourism capacity, however anticipated use will not increase over the other benchmarks.
e. The Forest Service budget will be reduced to $33 million.

(NON) MAX PNV (No Additional Wilderness)

Significant findings from this benchmark are listed below:

a. Timber harvest levels will be increased 10 MMBF per year in the first decade over the maximum present net value benchmark. This indicates that forcing all available acres into commodity management does not yield significant increases in timber production.
b. The present net value of the Forest will be reduced less than $10 million due to the forced commodity management of all available acres.

(FSH) MAX Fish

The findings from this benchmark are listed below:

a. This benchmark is identical to the maximum present net value benchmark. Maximum fish production is therefore consistent with maximizing present net value. All

outputs and costs associated with maximum fish production are the same as those associated with benchmark three.

b. There is no economic trade-off associated with maximum fish production, due to no economic trade-offs occurring between timber harvesting and fish production.
c. Since riparian areas were not being harvested in the maximum present net value benchmark anyway, the production of maximum levels of fish has no additional impact on timber harvesting.

(RCR) MAX Recreation

Some significant findings from this benchmark are listed below:

a. The allowable sale quantity will be 370 MMBF per year in the first decade. This is the economic harvest level associated with maximum recreation production. This is a reduction of 210 MMBF from the maximum present net value benchmark.
   No logging will occur in areas of identified recreation use.
b. Recreation capacity is increased to 4,600 thousand visitor days by the end of the fifth decade. The result is excess capacity above demand for the next 50 years.
c. The protection of important recreation use areas from logging and the relatively low harvest level in this benchmark reduces the rate of decline for wildlife species. The decline in wildlife species over the next 50 years ranges from a low of 7 percent for the red squirrel and high of 30 percent for the brown creeper.
d. Maximum recreation capacity and use has no effect on salmon habitat.

(WLD) MAX Old-Growth Wildlife

Some significant findings from this benchmark are listed below:

a. The allowable sale quantity will be 40 MMBF per year in the first decade if the reduction of habitat for old-growth species is limited to only one percent. This is a reduction of 93 percent from the maximum present net value benchmark, and 91 percent from the current benchmark. This indicates there is a strong relationship between the amount of timber harvest and the reduction of old-growth habitat.
b. The opportunity cost associated providing a minimum reduction to old-growth habitat is $480 million dollars Forestwide.

c. Less than ten miles of road construction will occur per year for the next forty years.
d. Recreation capacity will increase slightly, but use will remain the same as compared to maximum present net value benchmark.
e. The reduction of habitat for all species will be only 1 percent over the next 50 years.
f. Salmon production will be the same as in the maximum present net value benchmark.
g. The demand for hunting and sport fishing will be met as in the maximum present net value benchmark.
h. The Forest Service budget will be reduced to $20 million per year.

<u>(CUR) Current Level</u>

Significant findings from this benchmark are listed below:

a. The current allowable sale quantity of 450 MMBF per year will be maintained.
b. Reforestation will have to increase to 23,300 acres per year due to lower volume stands being treated.
c. 5 MMBF per year will be harvested from riparian areas.
d. Recreation and tourism capacity will remain constant over the next 50 years and will meet or exceed demand in all time periods.
e. Reductions will occur in wildlife habitat for all species with the largest reductions (over 20 percent) happening to bald eagle, deer, brown creeper, and hairy woodpecker habitat. Moderate reductions (10 percent to 20 percent) will occur to black bear, marten, red breasted sapsucker, river otter, and red squirrel habitat.
f. Salmon habitat capability will increase for all species.
g. There will be sufficient habitat for fish and wildlife to meet the demand for hunting and sport fishing in all time periods.

<u>(GRP) Group Selection</u>

Some of the significant findings from this benchmark are listed below.

a. The present net value was reduced $50 million or 1 percent.
b. First decade timber harvest is 480 MMBF per year. This represents a reduction of 100 MMBF per year or 17 percent.

(NDY) Non-declining Yield Analysis

Significant findings from this benchmark are listed below:
a. The present net value can be increased $50 million or 1 percent if non-declining yield is relaxed.
b. The first decade timber harvest can be increased 310 MMBF or 53 percent if non-declining yield is relaxed.

(CMI) Culmination of Mean Annual Increment Analysis

Significant findings from this benchmark are listed below:
a. The present net value can be increased $40 million if culmination of mean annual increment is relaxed.
b. The first decade timber harvest can be increased 40 MMBF or 7 percent if culmination of mean annual increment is removed.

(VPD) Maintaining Viable Populations Analysis

The significant findings from this benchmark are listed below:
a. The present net value can be increased $30 million if viable populations are relaxed.
b. The first decade timber harvest can be increased 70 MMBF or 12 percent if viable populations are relaxed.

(RIP) Riparian Protection Analysis

The significant findings from this benchmark are listed below:
a. The present net value can not be increased if riparian protection is relaxed.
b. The first decade timber harvest can not be increased if riparian protection is relaxed.

(DSP) Harvest Unit Dispersion Analysis

The significant findings of this benchmark are listed below:
a. The present net value will not be increased if the harvest unit dispersion constraint is removed. This constraint has no economic opportunity cost.
b. The first decade timber harvest can be increased 10 MMBF or 2 percent if the harvest unit dispersion constraint is relaxed.

BENCHMARK CONCLUSIONS

This section explains conclusions the Forest reached as a result of the benchmark analysis. It includes discussions of the interactions between benchmarks and what was learned cumulatively from them.

Present net value

1. Present net value is primarily influenced by timber harvest level. The maximum present net value benchmark produces 580 MMBF. As benchmarks produce lower or higher harvest levels the PNV drops.
2. The lowest present net value is produced by the maximum old-growth habitat benchmark due to its harvest of only 40 MMBF per year.
3. The maximum timber resource benchmark also produces a low PNV. This is because the harvest level of 780 MMBF requires the use of lands not economically efficient for timber production.
4. The maximum fish production benchmark has no impact on present net value.

Timber Allowable Sale Quantity

1. The most economically efficient timber harvest level is 580 MMBF per year.
2. The allowable sale quantity can be most easily increased by removing the non-declining yield constraint.
3. Limiting the reduction of old-growth wildlife habitat has a dramatic impact on timber harvest levels
4. The current harvest level of 450 MMBF can be sustained over time.
5. The maximum timber harvest level that can be produced without relaxing constraints is 780 MMBF in the first decade.
6. The maximum fish production benchmark has no impact on timber harvest levels.
7. Non-market resource values have only a 10 MMBF effect on timber harvest levels
8. A maximum wilderness allocation will drop the harvest level 430 MMBF or 74 percent.
9. Only an additional 10 MMBF can be economically produced from areas if all lands were allocated to commodity emphasis.
10. Protection of all areas of important recreation use will drop the harvest level 210 MMBF or 36 percent.

Long-term Sustained Yield

1. The long-term sustained yield capacity of the forest is much greater than the short-term harvest opportunities. This is a result of a skewed age class distribution of the Forest towards older stands which are producing no growth. Once these are replaced with young fast growing stands the harvest levels will be able to be increased.
2. The long-term sustained yield is dramatically reduced by removing acres from the suitable land base. Those benchmarks which remove significant acres from the

possibility of future timber harvest such as maximum Wilderness, maximum old-growth habitat, and maximum recreation, have the most pronounced reduction of long-term sustained yield.

Reforestation	1.	The amount of reforestation is directly tied to the timber harvest level. Those benchmarks which have the higher timber harvest levels, also require the higher amounts of reforestation.
Riparian Harvest	1.	The most economically efficient harvest level for riparian areas is zero.
	2.	Only those benchmarks which have an explicit timber harvest level required do any harvesting in riparian areas.
Road Construction	1.	The amount of road construction is directly tied to the timber harvest level. Those benchmarks which have the higher timber harvest levels also require the higher amounts of road construction.
	2.	The least amount of road construction occurs in the maximum Wilderness and maximum old-growth habitat benchmarks due to their low timber harvest levels.
Recreation and Tourism	1.	There will be sufficient recreation capacity to meet projected demand in all benchmarks. This results in no change in the anticipated amount of recreation and tourism use between any of the benchmarks.
	2.	In all benchmarks except maximum recreation and maximum old-growth habitat, recreation capacity is exactly equal to demand after 50 years. There will not be any excess recreation capacity in these benchmarks after the fifth decade. Maximum recreation and maximum old-growth habitat benchmarks will still have a slight amount of excess recreation capacity after 50 years.
Wildlife Habitat	1.	Wildlife habitat will decline for all species in all benchmarks (however, only slightly in Benchmark 13), except minimum level management.
	2.	All listed wildlife species predominantly use old-growth habitat. Timber harvest of old-growth reduces the amount of old-growth left remaining and hence the amount of wildlife habitat.
	3.	Those benchmarks which have the highest amount of timber harvesting indicate largest rate of decline in wildlife habitat.
	4.	The brown creeper, due to its sole use of high volume old-growth for wildlife habitat, shows the largest decline in all benchmarks.
	5.	The brown bear, black bear, and red squirrel show the lowest decline across the benchmarks since they utilize some habitat other than old-growth timber stands.

6. Bald eagles, deer, marten, red breasted sapsucker, hairy woodpecker, and river otter show moderate declines in all benchmarks.
7. No benchmark reduces any wildlife population below a viable population level.

Salmon Habitat

1. Salmon habitat is maintained or enhanced in all benchmarks.
2. All fisheries improvement projects are constructed in every benchmark with the exception of minimum level management.
3. Management requirements for riparian protection, which are contained in all benchmarks, prevent any serious or adverse impacts to fish habitat in all benchmarks.
4. Riparian areas have a higher economic value for fish production than timber harvesting.

Hunting and Fishing

1. There will be sufficient wildlife and fish populations to meet anticipated demand for hunting and sport fishing in all benchmarks for the next 50 years. This results in no change in the anticipated amount of hunting and sport fishing between any of the benchmarks.

Forest Service Cost

1. Changes in Forest Service costs between benchmarks are directly tied to the timber harvest level in that benchmark. Since the resource production levels for resources other than timber are relatively constant between the benchmarks, their associated costs are also constant. The primary output, and hence cost, which varies between the benchmarks is timber.

TABLE B-7

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

	BENCHMARKS												
ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
PNV (MM$)	3.61	4.71	4.59	4.59	4.123	4.48	4.25	4.15	4.59	4.59	4.11	4.29	4.41
TIMBER ALLOWABLE SALE QUANTITY (MMBF)													
Base Year	450	450	450	450	450	450	450	450	450	450	450	450	450
Decade 1	0	930	580	590	780	1,150	850	150	590	580	40	370	450
Decade 2	0	610	560	560	780	790	820	130	560	560	40	370	450
Decade 3	0	890	660	660	920	890	920	140	660	660	40	370	460
Decade 4	0	870	650	650	810	450	840	160	650	650	40	360	450
Decade 5	0	490	580	590	790	320	760	140	590	580	40	350	450
LONG TERM SUSTAINED YIELD													
(MMBF)	0	1,180	1,510	1,520	1,950	1,320	1,740	360	1,520	1,510	430	600	1,240
(MMCF)	0	280	340	340	410	300	370	70	340	340	110	140	250
REFORESTATION (Thousands of acres)													
Base Year	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
Decade 1	0	35.2	22.2	22.5	28.1	42.7	31.3	5.8	24.0	22.1	1.4	13.7	23.3
Decade 2	0	23.3	19.7	19.8	27.3	31.3	29.7	4.5	19.8	19.6	1.3	12.1	16.2
Decade 3	0	35.1	26.2	26.1	35.3	34.8	34.7	5.0	26.2	26.2	1.4	12.8	17.5
Decade 4	0	36.0	25.5	25.6	31.6	19.4	35.4	6.2	25.5	25.5	1.3	12.7	25.4
Decade 5	0	25.4	24.7	24.7	33.1	15.7	37.5	5.5	24.6	24.7	1.3	13.0	42.4
RIPARIAN AREA HARVEST (MMBF/yr)													
Base Year	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Decade 1	0	0	0	0	53	4	42	0	0	0	0	5	5
Decade 2	0	0	0	0	53	4	42	0	0	0	0	5	5
Decade 3	0	0	0	0	53	4	42	0	0	0	0	5	5
Decade 4	0	0	0	0	53	4	42	0	0	0	0	5	5
Decade 5	0	0	0	0	53	4	42	0	0	0	0	5	5
ROAD CONSTRUCTION (Miles)													
Base Year	110	110	110	110	110	110	110	110	110	110	110	110	110
Decade 1	0	190	200	210	370	250	270	40	90	200	-	180	170
Decade 2	0	210	270	270	410	310	270	40	170	270	-	230	220
Decade 3	0	260	220	220	290	260	260	30	190	220	-	120	150
Decade 4	0	270	170	190	240	150	260	40	190	170	-	100	160
Decade 5	0	180	190	190	251	120	280	40	210	190	10	90	290

TABLE B-7(cont)

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
	BENCHMARKS												
RECREATION AND TOURISM CAPACITY (MRVD)													
Base Year	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
Decade 1	4,300	4,200	4,200	4,200	4,200	4,200	4,100	4,300	4,200	4,200	4,300	4,300	4,200
Decade 2	4,300	4,000	4,200	4,200	4,100	3,900	3,900	4,300	4,200	4,200	4,300	4,300	4,200
Decade 3	4,300	3,900	4,000	4,000	3,900	3,800	3,800	4,300	4,000	4,000	4,300	4,300	4,200
Decade 4	4,300	4,000	4,000	4,000	4,000	4,000	4,000	4,200	4,000	4,000	4,300	4,300	4,200
Decade 5	4,300	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,300	4,600	4,200
RECREATION AND TOURISM USE (MRVD)													
Base Year	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Decade 1	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Decade 2	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400	3,400
Decade 3	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800	3,800
Decade 4	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Decade 5	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
BROWN BEAR (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 2	0%	0%	0%	0%	0%	-1%	0%	0%	0%	0%	0%	0%	0%
Decade 3	0%	-2%	-2%	-2%	-2%	-3%	-2%	0%	-2%	-2%	0%	0%	0%
Decade 4	0%	-5%	-3%	-3%	-6%	-5%	-5%	0%	-3%	-3%	0%	-1%	-1%
Decade 5	0%	-9%	-4%	-4%	-10%	-7%	-10%	0%	-4%	-4%	0%	-1%	-2%
EAGLE (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-6%	-3%	-3%	-3%	-2%	-3%	-1%	-3%	-3%	0%	-2%	-1%
Decade 2	0%	-8%	-4%	-4%	-6%	-12%	-10%	-2%	-5%	-4%	-1%	-2%	-3%
Decade 3	0%	-20%	-9%	-9%	-21%	-26%	-21%	-3%	-9%	-9%	-1%	-4%	-7%
Decade 4	0%	-34%	-22%	-22%	-30%	-33%	-34%	-5%	-23%	-23%	-1%	-8%	-12%
Decade 5	0%	-44%	-32%	-32%	-41%	-40%	-41%	-7%	-32%	-32%	-1%	-10%	-23%

TABLE B-7(cont)

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

	BENCHMARKS												
ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
DEER (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-9%	-6%	-6%	-7%	-9%	-7%	-2%	-6%	-6%	0%	-4%	-4%
Decade 2	0%	-14%	-10%	-10%	-12%	-17%	-14%	-3%	-10%	-10%	-1%	-6%	-8%
Decade 3	0%	-22%	-15%	-15%	-22%	-26%	-23%	-4%	-15%	-15%	-1%	-9%	-13%
Decade 4	0%	-31%	-23%	-23%	-29%	-31%	-31%	-6%	-23%	-23%	-2%	-13%	-17%
Decade 5	0%	-38%	-30%	-30%	-36%	-35%	-36%	-7%	-30%	-30%	-2%	-16%	-23%
BROWN CREEPER (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-4%	-18%	-18%	-15%	-21%	-22%	-5%	-18%	-18%	-2%	-13%	-11%
Decade 2	0%	-14%	-26%	-26%	-26%	-28%	-30%	-7%	-26%	-26%	-2%	-17%	-22%
Decade 3	0%	-21%	-32%	-32%	-37%	-40%	-40%	-11%	-32%	-32%	-2%	-27%	-28%
Decade 4	0%	-34%	-38%	-38%	-43%	-46%	-47%	-12%	-38%	-38%	-2%	-29%	-31%
Decade 5	0%	-43%	-47%	-47%	-52%	-50%	-51%	-14%	-47%	-47%	-2%	-30%	-39%
BLACK BEAR (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-1%	0%	0%	0%	-1%	-1%	0%	0%	0%	0%	0%	0%
Decade 2	0%	-6%	-4%	-4%	-5%	-6%	-5%	-1%	-4%	-4%	0%	-2%	-3%
Decade 3	0%	-10%	-6%	-6%	-9%	-12%	-10%	-2%	-7%	-6%	0%	-3%	-5%
Decade 4	0%	-16%	-11%	-11%	-15%	-18%	-16%	-2%	-11%	-11%	-1%	-5%	-7%
Decade 5	0%	-21%	-16%	-16%	-20%	-20%	-20%	-3%	-16%	-16%	-1%	-7%	-10%
PINE MARTIN (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-4%	-2%	-2%	-4%	-6%	-4%	-1%	-3%	-2%	0%	-2%	-2%
Decade 2	0%	-8%	-6%	-6%	-8%	-12%	-9%	-1%	-6%	-6%	0%	-4%	-5%
Decade 3	0%	-15%	-10%	-10%	-14%	-17%	-15%	-2%	-10%	-10%	-1%	-6%	-8%
Decade 4	0%	-21%	-15%	-15%	-20%	-21%	-21%	-3%	-15%	-15%	-1%	-8%	-12%
Decade 5	0%	-25%	-20%	-20%	-25%	-24%	-26%	-4%	-20%	-20%	-1%	-10%	-14%
RED BREASTED SAPSUCKER (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-6%	4%	4%	5%	-7%	-5%	1%	-4%	4%	0%	-2%	3
Decade 2	0%	-10%	-7%	-7%	-9%	-13%	-10%	-2%	-7%	-7%	0%	-4%	-5
Decade 3	0%	-16%	-11%	-11%	-16%	-19%	-16%	-2%	-12%	-11%	-1%	-6%	-8
Decade 4	0%	-22%	-16%	-16%	-21%	-22%	-23%	-4%	-16%	-16%	-1%	-8%	-11
Decade 5	0%	-27%	-20%	-20%	-27%	-25%	-30%	-4%	-20%	-20%	-1%	-10%	-15

TABLE B-7(cont)

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
HAIRY WOODPECKER (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-11%	-8%	-8%	-8%	-13%	-10%	-2%	-8%	-8%	-1%	-5%	-5%
Decade 2	0%	-18%	-13%	-13%	-16%	-22%	-18%	-3%	-14%	-13%	-1%	-9%	-11%
Decade 3	0%	-28%	-20%	-20%	-26%	-31%	-28%	-5%	-20%	-20%	-1%	-14%	-16%
Decade 4	0%	-36%	-28%	-28%	-34%	-36%	-36%	-7%	-28%	-28%	-1%	-18%	-21%
Decade 5	0%	-41%	-34%	-34%	-41%	-39%	-43%	-9%	-34%	-34%	-1%	-21%	-26%
RIVER OTTER (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-6%	-4%	-4%	-4%	-4%	-5%	-1%	-4%	-4%	0%	-1%	-3%
Decade 2	0%	-9%	-5%	-5%	-8%	-12%	-10%	-1%	-5%	-5%	0%	-2%	-4%
Decade 3	0%	-20%	-13%	-13%	-20%	-24%	-21%	-2%	-13%	-13%	-1%	-4%	-7%
Decade 4	0%	-31%	-22%	-22%	-28%	-29%	-30%	-4%	-22%	-22%	-1%	-6%	-11%
Decade 5	0%	-39%	-29%	-29%	-37%	-35%	-36%	-5%	-29%	-29%	-1%	-8%	-18%
RED SQUIRREL (percent change in habitat capability)													
Base Year	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Decade 1	0%	-4%	-2%	-2%	-3%	-4%	-3%	-1%	-2%	-6%	0%	-1%	-3%
Decade 2	0%	-6%	-3%	-3%	-6%	-7%	-5%	-1%	-3%	-6%	0%	-3%	-4%
Decade 3	0%	-9%	-7%	-7%	-10%	-11%	-10%	-1%	-7%	-7%	0%	-3%	-7%
Decade 4	0%	-13%	-9%	-9%	-13%	-12%	-14%	-2%	-9%	-9%	0%	-5%	-11%
Decade 5	0%	-17%	-11%	-11%	-17%	-15%	-20%	-2%	-11%	-11%	0%	-7%	-18%
COMMERCIAL SALMON (Millions of pounds)													
Base Year	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0	118.0
Decade 1	118.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
Decade 2	118.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
Decade 3	118.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
Decade 4	118.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
Decade 5	118.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0	130.0
KING SALMON (Millions of pounds)													
Base Year	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Decade 1	7.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 2	7.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 3	7.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 4	7.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 5	7.3	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

TABLE B-7(cont)

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
COHO SALMON (Millions of pounds)													
Base Year	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Decade 1	10.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Decade 2	10.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Decade 3	10.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Decade 4	10.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Decade 5	10.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
CHUM SALMON (Millions of pounds)													
Base Year	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Decade 1	27.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Decade 2	27.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Decade 3	27.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Decade 4	27.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Decade 5	27.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
PINK SALMON (Millions of pounds)													
Base Year	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6	57.6
Decade 1	57.6	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Decade 2	57.6	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Decade 3	57.6	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Decade 4	57.6	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
Decade 5	57.6	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0	63.0
SOCKEYE SALMON (Millions of pounds)													
Base Year	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6
Decade 1	7.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 2	7.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 3	7.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 4	7.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Decade 5	7.6	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
SPORT FISHING (Thousands of user days)													
Base Year	160	160	160	160	160	160	160	160	160	160	160	160	160
Decade 1	220	220	220	220	220	220	220	220	220	220	220	220	220
Decade 2	250	250	250	250	250	250	250	250	250	250	250	250	250
Decade 3	275	275	275	275	275	275	275	275	275	275	275	275	275
Decade 4	280	280	280	280	280	280	280	280	280	280	280	280	280
Decade 5	290	290	290	290	290	290	290	290	290	290	290	290	290

TABLE B-7(cont)

BENCHMARKS

Average Annual Outputs and Activities

(Decade 1 is the period 1990-1999)

	BENCHMARKS												
ACTIVITY/RESOURCE	MLV	FLW	PNV	MKV	TBR	TBD	TBC	WLN	NON	FSH	WLD	RCR	CUR
HUNTING (Thousands of user days)													
Base Year	40	40	40	40	40	40	40	40	40	40	40	40	40
Decade 1	50	50	50	50	50	50	50	50	50	50	50	50	50
Decade 2	60	60	60	60	60	60	60	60	60	60	60	60	60
Decade 3	70	70	70	70	70	70	70	70	70	70	70	70	70
Decade 4	75	75	75	75	75	75	75	75	75	75	75	75	75
Decade 5	80	80	80	80	80	80	80	80	80	80	80	80	80
AREA MAINTAINED (Millions of Acres) IN A NATURAL CONDITION	15.8	7.4	6.3	5.8	5.4	8.0	5.4	15.8	5.4	6.3	10.1	6.5	5.4
TOTAL FOREST SERVICE COST (Millions of dollars)													
Base Year	55	55	55	55	55	55	55	55	55	55	55	55	55
Decade 1	15	122	89	91	139	154	139	33	72	89	20	75	76

MARGINAL COST OF MANAGEMENT REQUIREMENTS

The following Table B-8 shows the change in PNV caused by the managment requrements. The FLW Benchmark (Max PNV without management requirements) is used as the basis of comparison since it has the fewest limits placed on the goal to maximize PNV. Virtually all of the reductions in PNV were geberated by corresponding reductions in timber harvest.

Addition of the managment requirements (MR's) and timber policy constraints decrease PNC $126 million from the unconstrained amount in the FLW Benchmark (see Appendix B, Constraints for further discussion of these constraints). This represents about a 3 percent decrease in PNV. The primary factor leading to this reduction in PNV was the drop in the timber harvest level, which decreased 350 MMBF annually in the first decade or 38 percent. In the four subsequent decades the harvest was also dropped an average of 103 MMBF annually. The contribution of other resources (commercial fish, recreation, etc) remained fairly constant in their contribution to PNV.

Of the $126 million reduction in PNV, $49 million, or 39 percent, can be attributed to maintaining a nondeclining yield policy (NDY). This policy requires that timber harvest levels do not decline from period to period. The NDY policy results in 310 MMBF of the total 350 MMBF annual reduction in timber harvest during the first decade or 89% of the total harvest reduction. Insuring timber harvest at or beyond culmination of mean annual increment reduces PNV by $43 million and first decade harvest by 40 MMBF. Providing suffecient habitat to maintain viable wildlife and fish populations reduces PNV $32 milliom dollars and first decade harvest by 70 MMBF. Only $1 million of the total reduction can be attributed to maintaining riparian habitat. Limiting the size of clearcuts and requiring that they not be adjacent to one another (dispersion constraint), reduces PNV $6 million by increasing the cost of timber harvesting.

TABLE B-8

PRESENT NET VALUE COMPARISON, MARGINAL COST OF CONSTRAINTS

(Millions of 1985 Dollars)

Benchmark or Constraints	Present Net Value	Change in Present Net Value1/	Discounted Cost	Change in Discounted Cost1/	Discounted Benefits	Change in Discounted Benefits	DISCOUNTED BENEFITS BY RESOURCE: Comm. Fish	Timber	All Rec.	Other	DISCOUNTED COSTS BY CATEGORY: Roads	Timber	All Rec.	Other
MAX PNV w/o MMRs	4,715	0	2,298	0	7,013	0	2,152	2,620	1,766	475	1,415	724	51	108
NDY Constraint		-49		-946		-995								
CMAI Constraint		-43		-782		-825	See text for discussion of individual constraint effects on resource benefit and cost categories.							
Viable Population Constraint		-32		-872		-904								
Riparian & Soil Constraint		-1		-1		0								
Dispersion Constraint		-1		0		-1								
MAX PNV with MMRs	4,589	-126	1,201	-1,097	5,790	-1,223	2,152	1,353	1,766	519	734	363	51	53

1/ All changes are measured incrementally from the MAX PNV w/o MMRs (FLW) benchmark.

ALTERNATIVES

This section describes the modeling strategies used in the alternatives. For a more complete discussion of the displays and results of all the alternatives, refer to Chapter 2 of the EIS. Chapter 2 lists all the constraints unique to an alternative, and Chapter 3 discusses how those constraints change the environmental consequences of the alternatives.

ALTERNATIVE A

Theme of the Alternative

The theme of this alternative is to emphasize high-quality fish and wildlife habitat, Wilderness and unroaded areas, wild and scenic rivers, scenic quality, subsistence use, and a wide range of recreation opportunities in a natural setting. It incorporates the 23 areas recommended for Wilderness designation in House of Representatives Bill 987 (H.R. 987). Timber harvest and mining may occur at levels compatible with the amenity emphasis of this alternative.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All lands identified in HR 987 were sent to a Min Level prescription precluding timber harvest.

6. All priority 1 RNAs were sent to a Min Level prescription precluding timber harvest.

7. All enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

8. All value comparison units (VCUs) which have a Forest Habitat Integrity Program (FHIP) rating of 1 and are still currently roadless were sent to a minimum level prescription with no timber harvest.

9. All beach fringe and estuary areas were sent to a Min Level prescription precluding timber harvest.

10. All identified recreation places with an ROS rating of primitive or semi-primitive were sent to a Min Level prescription precluding timber harvest.

11. Areas allocated as a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

12. Areas allocated to a LUD I release or LUD II in the current Forest plan were sent to a Min Level precsription with no timber harvest.

13. Constraints were impsosed on all areas identified as recreation places with an ROS of Roaded Natural, Rural, or Urban to limit the amount of timber harvesting and meet the visual quality objectives.

14. Constraints were imposed on areas identified as sensitivity level 1 viewsheds to limit the amount of timber harvesting and meet the visual quality objectives.

15. Constraints were imposed on areas with an inventoried visual quality objective of maximum modification to limit the amount of timber harvesting and meet the visual quality objective.

16. All riparian areas associated with a Class I or Class II stream were sent to a Min Level prescription precluding timber harvest.

17. All riparian areas associated with a Class III stream available for timber harvest were limited to selective harvest only.

ALTERNATIVE B

Theme of the Alternative.

The theme of this alternative is to emphasize resource uses that contribute to the local and regional economies of Southeast Alaska, such as timber harvesting, commercial fishing, mining and tourism. Non-market values (such as wildlife habitat or visual quality), roadless area opportunities, and wild and scenic rivers will be emphasized in selected areas. Opportunities for local residents to pursue traditional lifestyles, including subsistence use and recreation, will also be emphasized. This alternative incorporates the 12 "protected areas" recommended by the Southeast Conference proposal of March, 1989.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All lands identified in the original Southeast Conference as "protected areas" were sent to a Min Level prescription precluding timber harvest.

6. All priority 1 RNAs were sent to a Min Level prescription precluding timber harvest.

7. All enacted municple watersheds were sent to a Min Level prescription precluding timber harvest.

8. All value comparison units (VCUs) which have a Forest Habitat Integrity Program (FHIP) rating of 1 and are still currently roadless were sent to a minimum level prescription with no timber harvest.

9. All beach fringe and estuary areas were sent to a Min Level prescription precluding timber harvest.

10. All identified recreation places with an ROS rating of primitive or semi-primitive were sent to a Min Level prescription precluding timber harvest.

11. Areas allocated as a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

12. Areas allocated to a LUD I release or LUD II in the current Forest plan were sent to a minimum level precription with no timber harvest.

13. Constraints were impsosed on all areas identified as recreation places with an ROS of Roaded Natural, Rural, or Urban to limit the amount of timber harvesting and meet the visual quality objectives.

14. Constraints were imposed on areas identified as sensitivity level 1 viewsheds to limit the amount of timber harvesting and meet the visual quality objectives.

15. Constraints were imposed on areas allocated to LUD III in the current Forest plan which also had an inventoried visual quality objective other than maximum modification to limit the amount of timber harvesting and meet the visual quality objectives.

16. All riparian areas associated with a Class I or Class II stream were sent to a Min Level prescription precluding timber harvest.

17. All riparian areas associated with a Class III stream available for timber harvest were limited to selective harvest only.

18. Constraints were imposed to insure enough timber was harvested from within the long-term sale boundries to complete the long-term contracts.

19. Constraints were imposed to insure enough timber volume was scheduled from specific geographic zones on the Chatham Area to meet identified needs in the Alaska Pulp Corporation operating plans.

ALTERNATIVE C

Theme of the Alternative

The theme of this alternative is to continue the land allocations, resource outputs and activities, and management direction of the current Forest plan. Timber harvest levels contributing to maintainanc of local employment are emphasized, along with maintaining the variety of recreation opportunities and scenic quality currently available. Opportunities for local residents to pursue traditional lifestyles, including subsistence use and recreation, will continue.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

6. All areas allocated to LUD II in the current Forest plan were sent to a mninimum level timber prescription with no timber harvest.

7. All areas allocated to a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

8. Areas allocated to a LUD III in the current Forest plan and are also in the beach fringe or estuary areas were sent to a minimum level timber prescription with no timber harvest.

9. All areas allocated to LUD III in the current Forest plan were constrained to limit the amount of timber harvest and meet the inventoried visual objectives.

10. Areas mapped for retention under the current Forest plan implementation were sent to a minimum level precription with no timber harvest.

11. Harvest in all riparian areas was limited to selective cutting only.

12. The allowable sale quantity was set to 450 MMBF per year in the first decade.

13. Constraints were imposed to insure enough timber was harvested from within the long-term sale boundries to complete the long-term contracts.

14. Constraints were imposed to insure enough timber volume was scheduled from specific geographic zones on the Chatham Area to meet identified needs in the Alaska Pulp Corporation operating plans.

15. All lands in the isolated operability class were sent to a Min Level prescription precluding timber harvest.

16. Strata C and D were not allowed to contribute more the 50 percent of the total ASQ in the first decade.

17. Precommercial thinning was limited to less than 6,300 acres per year.

ALTERNATIVE D

Theme of the Alternative

The theme of this alternative is to provide an economic timber supply from public lands to meet predicted demand, and existing mill capacity. Other resources will be managed in an efficient manner consistent with the emphasis on timber supply while meeting environmental standards. Some areas with low timber volumes will be managed for recreation, visual quality and other non-commodity resources. Areas in and around communities will be managed to provide for recreation and related traditional uses, including subsistence.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. Enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

6. Estuary areas were sent to a Min Level prescription precluding timber harvest.

7. Identified recreation places within 15 miles of a community which currently have an ROS class of either primitive or semi-primitive were sent to a Min Level prescription precluding timber harvest.

8. Identified recreation places within 15 miles of a community which currently have an ROS class of either rural, roaded natural, or urban were constrained in order to limit the amount of timber harvest and meet the visual objectives.

9. Areas with low economic value for timber harvesting were sent to a Min Level prescription precluding timber harvest.

10. Harvest in all riparian areas was limited to selective cutting prescription only.

11. The allowable sale quantity was set to 550 MMBF per year in the first decade.

12. Constraints were imposed to insure enough timber was harvested from within the long-term sale boundries to complete the long-term contracts.

13. Constraints were imposed to insure enough timber volume was scheduled from specific geographic zones on the Chatham Area to meet identified needs in the Alaska Pulp Corporation operating plans.

ALTERNATIVE E

Theme of the Alternative

The theme of this alternative is to incorporate the 23 areas recommended for Wilderness designation in House of Representatives Bill 987 (H.R. 987). All other areas would continue with the land allocations, resource outputs and activities, and management direction of the current Forest plan.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All areas identified in H.R. 987 were sent to a Min Level prescription precluding timber harvest.

6. All enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

7. All areas allocated to LUD II in the current Forest plan were sent to a mninimum level timber prescription with no timber harvest.

8. All areas allocated to a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

9. Areas allocated to a LUD III in the current Forest plan and are also in the beach fringe or estuary areas were sent to a minimum level timber prescription with no timber harvest.

10. All areas allocated to LUD III in the current Forest plan were constrained to limit the amount of timber harvest and meet the inventoried visual objectives.

11. Areas mapped for retention under the current Forest plan implementation were sent to a minimum level precription with no timber harvest.

12. Harvest in all riparian areas was limited to selective cutting only.

13. All lands in the isolated operability class were sent to a Min Level prescription precluding timber harvest.

14. Strata C and D were not allowed to contribute more the 50 percent of the total ASQ in the first decade.

15. Precommercial thinning was limited to less than 6,300 acres per year.

ALTERNATIVE F

Theme of the Alternative

The theme of this alternative is to manage the 12 "protected areas" recommended by the Southeast Conference and endorsed by the Governor of the State of Alaska for non-timber uses. All other areas would continue with the land allocations, resource outputs and activities, and management direction of the current Forest plan.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All areas identified as "protected areas" in the original Southeast Conference were sent to a Min Level prescription precluding timber harvest.

6. All enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

7. All areas allocated to LUD II in the current Forest plan were sent to a mninimum level timber prescription with no timber harvest.

8. All areas allocated to a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

9. Areas allocated to a LUD III in the current Forest plan and are also in the beach fringe or estuary areas were sent to a minimum level timber prescription with no timber harvest.

10. All areas allocated to LUD III in the current Forest plan were constrained to limit the amount of timber harves and meet the inventoried visual objectives.

11. Areas mapped for retention under the current Forest plan implementation were sent to a minimum level precription with no timber harvest.

12. Harvest in all riparian areas was limited to selective cutting only.

13. Constraints were imposed to insure enough timber was harvested from within the long-term sale boundries to complete the long-term contracts.

14. Constraints were imposed to insure enough timber volume was scheduled from specific geographic zones on the Chatham Area to meet identified needs in the Alaska Pulp Corporation operating plans.

15. All lands in the isolated operability class were sent to a Min Level prescription precluding timber harvest.

16. Strata C and D were not allowed to contribute more the 50 percent of the total ASQ in the first decade.

17. Precommercial thinning was limited to less than 6,300 acres per year.

ALTERNATIVE G

Theme of the Alternative

The theme of this alternative is to manage for non-timber uses the areas recommended in the revised Southeast Conference proposal (revised 2/2/90). All other areas would continue with the land allocations, resource outputs and activities, and management direction of the current Forest plan.

Modeling Specifications

1. Objective Function: Maximize PNV for 15 periods.

2. All previously defined timber policy requirements were applied.

3. All previously defined MR's were applied.

4. All previously defined MIR's were applied.

5. All areas identified as "protected areas" in the revised Southeast Conference were sent to a Min Level prescription precluding timber harvest.

6. All enacted municiple watersheds were sent to a Min Level prescription precluding timber harvest.

7. All areas allocated to LUD II in the current Forest plan were sent to a mninimum level timber prescription with no timber harvest.

8. All areas allocated to a LUD III special in the current Forest plan were sent to a Min Level prescription precluding timber harvest.

9. Areas allocated to a LUD III in the current Forest plan and are also in the beach fringe or estuary areas were sent to a minimum level timber prescription with no timber harvest.

10. All areas allocated to LUD III in the current Forest plan were constrained to limit the amount of timber harves and meet the inventoried visual objectives.

11. Areas mapped for retention under the current Forest plan implementation were sent to a minimum level precription with no timber harvest.

12. Harvest in all riparian areas was limited to selective cutting only.

13. Constraints were imposed to insure enough timber was harvested from within the long-term sale boundries to complete the long-term contracts.

14. Constraints were imposed to insure enough timber volume was scheduled from specific geographic zones on the Chatham Area to meet identified needs in the Alaska Pulp Corporation operating plans.

15. All lands in the isolated operability class were sent to a Min Level prescription precluding timber harvest.

16. Strata C and D were not allowed to contribute more the 50 percent of the total ASQ in the first decade.

17. Precommercial thinning was limited to less than 6,300 acres per year.

Table B-9 summarizes the constraints that were modeled in FORPLAN for each alternative.

TABLE B-9

FORPLAN SPECIFICATIONS BY ALTERNATIVE

FORPLAN Specification	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Objective Function	PNV	PNV	PNV	PNV	PNV	PNV	PNV
Managaement Requirements	YES	YES	YES	YES	YES	YES	YES
Timber Policy Requirements	YES	YES	YES	YES	YES	YES	YES
Non-declining Yield	YES	YES	YES	YES	YES	YES	YES
Minimum Implementation Req.	YES	YES	YES	YES	YES	YES	YES
Beach Fringe Protected	All	All	Partial	Partial	Partial	Partial	Partial
Municipal Watersheds Protected	All	All	All	All	All	All	All
RNAs Protected	68,000 Acres	107,000 Acres	69,000 Acres	35,000 Acres	38,000 Acres	69,000 Acres	63,000 Acres
Recreation Places Protected	All	All	Only in Lud I/II & LUD III Special	Within 15 Miles of Comunities	In LUD I/II/III Special & HR 987 Areas	In LUD I/II/III Special & SE CON Protected Areas	In LUD I/II/III Special & SE CON Protected Areas
FHIP Watersheds protected	All	All	Only in Lud I/II & LUD III Special	Within 15 Miles of Comunities	In LUD I/II/III Special & HR 987 Areas	In LUD I/II/III Special & SE CON Protected Areas	In LUD I/II/III Special & SE CON Protected Areas
Specific Areas Removed from Timber Harvesting	HR 987 Areas & LUD II/III Special	SE Conf. Areas LUD II/III Special	LUD II/III Special	None	HR 987 Areas & LUD II/III Special	SE Conf. Areas & LUD II/III Special	SE Conf. 2 Areas & LUD II/III Special
Visual Protection	All Viewsheds	All Viewsheds	In LUD I/II/III	Within 15 Miles of Comunities	In LUD I/II/II & HR 987 Areas	In LUD I/II/III & SE Conference Protected Areas	In LUD I/II/II & SE Conference Protected Areas
Long Term Sales Maintained	NO	YES	YES	YES	NO	YES	YES
Harvest Volume Specified	None	None	450 MMBF	550 MMBF	None	None	None
Non-declining Yield Specified For Each Administrative Area	YES	YES	YES	YES	YES	YES	YES
Isolated Stands Allowed to be Harvested	YES	YES	NO	YES	YES	NO	NO
Strata C/D Limited to Less Than 50% of 1st Decade ASQ	NO	NO	YES	NO	YES	YES	YES
Limit On PCT	None	None	6,300 Acres	None	6,300 Acres	6,300 Acres	6,300 Acres

OTHER MODELS

Three other systematic models were used by the Forest: 1) the IPASS system, 2) the SEAPROG system, and 3) Habitat Capability Models (HCM). All are described below.

1. IPASS

The IPASS system was used to develop an input-output model, impact multipliers, and employment and income estimates for the alternatives analyzed in the EIS. IPASS is a system for developing local input-output models taken from the U.S. Department of Commerce's 1972 national input-output model (updated to 1977). Dollar impacts estimated for the system were further updated to 1982 dollars by using the Commerce Department's implicit price deflater for the gross national product.

The IPASS system was used to develop a input-output model of Southeast Alaska. Estimates of historical expenditures by sector associated with Forest outputs and Forest purchases from the local economy were then used with the input-output model to develop impact multipliers and estimated income and employment impacts for each alternative.

A number of assumptions used in the input-output modeling technique must be made when interpreting the resulting income and employment estimates:

a. Historical transaction patterns associated with Forest outputs and purchases are assumed to hold in the future.

b. Transaction patterns (production functions) for industries in the local economy are assumed to be similar to those in the national economy and are assumed to hold in the future.

c. Income and employment impacts are assumed to occur in the same time period as the underlying changes in Forest outputs and purchases (no lagged effects are assumed).

As a result of these basic assumptions, employment and income effects estimated for the alternatives have relatively low reliability in absolute terms for future time periods; however, the income and employment estimates are reasonably accurate indicators of relative changes between the alternatives in the first decade.

2. <u>SEAPROG</u>

The existing old-growth tables are by MAPPED volume class derived by running the 1980-85 inventory through SEAPROG - version 27 of the submittal system. Output volume is net live based on 32 foot scale for trees 9.0 inches and larger D.B.H. to a 6.0 inch top inside bark. Age and MAI values are not valid in uneven-age old-growth.

There are two sets of even-age second growth yield tables. The first is for fully stocked, live gross by Administrative Area, treatment and site index. They were produced from version 28 of the SEAPROG submittal system running seedling/sapling inventory plots without controlling species composition. The other set are empirical, representing expected net volume. They were produced from the first set by application of a flat factor of 11.4 percent (Taylor 1934, p. 17) less than full stocking, a flat factor of 1.0 percent for breakage, and a variable factor by age for defect derived from Figure 8 of Farr et. al. 1976. No adjustments, other than stocking, were applied for ages less than 70 since no harvest of younger ages is anticipated.

The apparent discrepencies in volume between Administrative Areas for the same treatment and site index is explained by greater diameter growth at lower latitudes, differences in composition, tree value classes, and how the model selects trees to kill when species composition is not controlled. The user should also be aware of variation in volume output between individual plots or stands within sample sets which produced the averages used in the tables.

Varification of SEAPROG has been limited to comparing SEAPROG results with the actual current volumes, etc. on six permanent plots with current ages ranging from 88 to 128 years. Model projections ranged from 25 to 49 years. Predicted compared to actual differences ranged from -9 percent to +19 percent for total cubic foot volume but the combined difference was only +0.5 percent. These were all unthinned plots.

Refinement of SEAPROG is an ongoing effort and verification of modeled thinning is underway at the present time.

3. Wildlife Habitat Capability Models

Habitat capability models were developed for each of the selected Management Indicator Species (MIS). Habitat Capability Models (HCM's) are a management tool developed by biologist in Southeast Alaska. An HCM is a compilation of biological information that describes the habitat requirements of MIS. These models were used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of the HCM's is to estimate the capability ofhabitats to support animal populations. The end result of each model is an estimation of a habitat suitability index (HSI) and associated population carrying capacity for each physical and biological condition on the Forest. These habitat capability models were developed by an interagency task force consisting of members from the Alaska Department of Fish and Game, The United States Fish and Wildlife Service, and the USDA Forest Service. The models were run on the Forest GIS database to estimate wildlife habitat indices. These indices were then input into the FORPLAN model which tracked changes over time in these wildlife indices due to land disturbing activities such as clearcutting. A description of each Wildlife Habitat Capability model follows.

HABITAT CAPABILITY MODEL FOR MOUNTAIN GOATS IN SOUTHEAST ALASKA: WINTER HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of mountain goats (*Oreamnos americanus*). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Year-round range of mountain goat is evaluated in the model.

The historical distribution of mountain goats included mountainous areas from southcentral Alaska to south-central Washington. Their range extended south to central Idaho and east to western Alberta and Montana (Johnson 1977). The current distribution of mountain goats has been expanded outside of its historic range as a result of transplant programs (Dalrymple 1970). The natural distribution of mountain goats in southeast Alaska included the mainland mountains. They have also been successfully introduced on Baranof and Revillagigedo Islands. Presently mountain goat populations are generally stable or increasing throughout their range in Alaska and interest in hunting or observing mountain goats continues to increase (Townsend 1986, Fox et al. in prep.).

Mountain goats are more sensitive to habitat change and hunting pressure than any other big game species in North America (Chadwick 1983). Studies throughout their range in North America have reported significant declines in populations of mountain goats following modification of habitats and disturbance from human activities (Chadwick 1973, Quaedulieg et al. 1973, Kuck 1977, Phelps et al. 1983). The potential for adverse affects of timber harvest and mining activities on mountain goats and their habitats throughout southeast Alaska currently exists (Schoen and Kirchhoff 1982, Smith and Raedeke 1982, Fox 1983, Smith 1986). This model is intended to describe the potential of habitats in southeast Alaska to support mountain goats and to provide a means to evaluate the affects of land management activities on this potential.

Habitat Use Information

A variety of vegetative food items are eaten by mountain goats throughout the year. These include foliage and seed heads of grasses, sedges, and bushes; foliage, stems, and flowers of forbs; leaves and twigs of shrubs and trees; leaves of ferns; and the entire aerial portion of mosses and lichens (Wigal and Coggins 1982). Foraging sites and forage composition change throughout the year.

Mountain goats have demonstrated a preference for shrub communities associated with south-facing avalanche slopes in the early spring (Schoen and Kirchhoff 1982). The herbaceous understory is one of the first areas to initiate plant growth in the spring. Rhizomes and new shoots of forbs and ferns in this community provide mountain goats with highly nutritious forage (Klein 1953, Hieljord 1971).

As snow melts during the summer, mountain goats move to higher elevation subalpine and alpine areas to feed on plants emerging from melting snowbanks (Fox 1978, Schoen and Kirchhoff 1982, Smith 1986). The new growth of sedges and forbs abundant in these areas are selected (Hieljord 1971).

Food available to mountain goats during the winter is much more restricted than during other seasons (Fox and Smith 1988). Accumulation of heavy wet snow in the alpine and subalpine areas, especially in southern southeast Alaska, covers available forage and forces mountain goats to lower elevation forested areas (Smith 1986). Plant species making up the bulk of mountain goats diet during the winter in those areas include conifers, lichens, mosses, and shrubs (Fox et al. in prep.). In some areas of northern southeast Alaska the snow is dryer and lighter. In these areas snow is blown off of ridge tops exposing plants and allowing the mountain goats to forage at higher elevations. Alpine forbs and graminoids continue to be important components of the mountain goats' diet throughout the winter in these areas.

Behavioral strategies of mountain goats to avoid predators, particularly gray wolves (Canis lupus) also affect habitat use by mountain goats. Mountain goats generally move into steep and broken terrain characterized by the presence of cliffs, when approached by gray wolves (Fox and Streveler 1986). Fox (1983) reported most use of habitats by mountain goats in southeast Alaska was within 660-980 ft (200-300 m) of cliffs. McFetridge (1977a) also reported that 95 percent of observations of mountain goats were within 980 ft (300 m) of escape terrain during October and November. Hieljord (1971) estimated that mountain goats on Kodiak Island and in the Kenai Mountains spent most of their time within 900 ft (275 m) of escape terrain during summer. Smith (1986) reported that 95 percent of all relocations of radio-collared mountain goats in southern southeast Alaska

were within 1300 ft (400 m) of cliffs and that all relocations were within 2600 ft (800 m). The need for escape terrain to be in close proximity is a critical factor in describing habitat for mountain goats.

Habitat Model

The primary considerations in the evaluation of habitat for mountain goat in southeast Alaska are availability of food and proximity to escape terrain. Availability of food is related to plant community and aspect. The relationship between these two variables and habitat suitability changes with season of the year.

Winter is the most limiting time of the year for mountain goats. Snow cover reduces the availability of plants to mountain goats. Alpine areas in southern southeast Alaska (i.e., Game Management Units 1A, 1B, and 4) are generally unavailable to mountain goats as foraging areas because of accumulation of dense snow. Conifer forests provide optimum habitat in southern southeast Alaska for mountain goats during this time period (Table 1). Forbs and shrubs remain available as forage in the higher volume, old-growth forests because snow depths are reduced by the tree canopy (Hanley and Rose 1987, Kirchhoff and Schoen 1987). Alpine areas in northern southeast Alaska (i.e., Game Management Units 1C, 1D, and 5) are often blown free of snow in the winter providing foraging opportunities for mountain goats. Therefore, alpine areas have a higher potential to support mountain goats in northern areas of southeast Alaska than in southern areas (Table 1). Although clearcuts provide forage, it may be generally unavailable to mountain goats in the winter because of snow accumulations. Stands of second growth forest are assumed to not have any value to mountain goats because of the lack of forage (Alaback 1982 and 1984).

Mountain goats preferred southerly aspects during the winter and avoided northerly aspects (Table 1) (Schoen and Kirchhoff 1982). Southerly exposures receive more sun light, are warmer, have a higher snow line, and accumulate less snow than northerly exposures. As a result, forage is more readily available and travel is less restricted. The index values assigned to southerly aspects are reduced by 70 percent for east/west aspects and by 90 percent for northerly aspects.

Prime escape terrain for mountain goats has been defined as slopes from 45^{o} to 75^{o} (Kuck 1973, Smith 1976, McFetridge 1977a, Fox 1978, Schoen and Kirchhoff 1982). Escape terrain in the model is assumed to be slopes (i.e., cliffs) greater than 50^{o}. Over 95 percent of all relocations of radio-marked mountain goats were within 1300 ft (400 m) of a cliff in southern southeast Alaska and all

relocations were within 2600 ft (800 m) of cliffs (Smith 1986). Optimum habitat values were assumed to occur within 1300 ft (400 m) of a slope greater than 50°. Habitat values of the area between 1300 ft and 2600 ft (400-800 m) of a cliff were reduced by 70 percent compared to areas that occur within 1300 ft (400 m) of a cliff. Habitats greater than 2600 ft (800 m) from a cliff were assumed to not have any habitat value for mountain goats. These relationships were assumed to be valid through all seasons regardless of vegetation, elevation, or aspect.

During the spring, mountain goats show a preference for areas where vegetation greens up early. This is reflected in the index value given to the shrub community (Table 1A). The shrubby avalanche chutes, especially on southerly aspects, are one of the first areas in the spring to produce new growth of forbs and shrubs. Clearcuts on southerly aspects also increase in value in the spring because of early foliage development (Reed 1983).

During summer and fall, mountain goats follow the snowline up into the subalpine zone, alpine and high-elevation avalanche chutes as the snow melts and new vegetation appears (Schoen and Kirchhoff 1982, March 1986). Consequently these high-elevation communities are assumed to provide optimum habitat during summer and fall (Table 2A). The value of conifer stands is assumed to be minimal during summer and fall because mountain goats spend very little time in these communities. Habitat selection is not influenced by aspect during summer and fall so index values do not consider this factor.

<u>Habitat Capability</u>

Smith and Bovee (1984) estimated the density of mountain goats on winter range in southern southeast Alaska to be 11.4 animals/mi^2 (4.4/km^2). They based their definition of winter range on work reported in Smith (1986). Smith (1986) defined preferred winter range as low elevation, higher volume, old-growth forests on southerly aspects, within 1300 ft (400 m) of cliffs. This is the same definition of optimum winter habitat used in the this model. The assumption is therefore made that optimum winter habitat will support 11.4 mountain goats/mi^2 (4.4/km^2). Density of mountain goats at other times of the year is assumed to approximate Smith and Bovee's (1984) figure for year-round habitats (i.e., 6 animals/mi^2 [2.3/km^2]).

<u>Disturbance and Human-induced Mortality</u>

McFetridge (1977b) indicated that use of suitable habitats by mountain goats may be reduced as a result of human activities. Chadwick (1973) reported that mountain goats will abandon otherwise suitable habitat following initiation

of human activities. Five of 7 populations of mountain goats evaluated in British Columbia experienced population declines (Pendergast and Bindernagel 1977). Four of the declining populations were accessible by road; none of the stable populations were accessible by road. These reports and personal observations (Dinneford, Schoen, and Young) indicate that populations of mountain goats are very sensitive to disturbance and poaching following the establishment of human activities in occupied habitat.

The effects of several activities that may result in reductions in numbers of mountain goats were evaluated (Table 2). The potential capability of habitats in the vicinity of these habitats are reduced by multiplying the density calculated from the habitat model by the appropriate disturbance/mortality coefficient.

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on mountain goat populations. This will be done to ensure the model results approximate the results of independent field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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ıble 2. Effects of disturbance on the habitat capability for mountain goats in southeast Alaska.

Activity/landscape Modification	Reduction Factor
FS cabin/developed campground/seasonal camp	
(≤ 1 mi radius)	0.9
Permanent camp site/ residence/float camp	
(< 1 mi radius)	0.6
(1-5 mi radius)	0.9
Access point (airstrip, dock, lake/float plane)	
(≤ 1 mi radius)	0.9
Road accessible to vehicles	
(≤ 2 mi radius)	0.8
Transportation link (ferry access/town)	
(≤ 2 mi radius)	0.6
Trails or road access limited to hiking	
(≤ 2 mi radius)	0.9

Table 1. Capability of habitats to support mountain goats during the winter (i.e., November through March) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50° Slope)												Greater Than 2600 ft	
	Within 1300 ft (400 m)[a] Aspect						1300-2600 ft (400-800 m) Aspect							
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
old-growth forest														
Conifer														
20,000+ bf/ac[b]														
S. SE AK.	1.0	11.4[c]	0.3	3.4	0.1	1.1	0.3	3.4	0.1	1.1	0.0	0.0	0.0	0.0
SE AK.	0.8	9.1	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
8-20,000 bf/ac														
S. SE AK.	0.8	9.1	0.2	2.3	0.0	0.0	0.2	2.3	0.0	0.0	0.0	0.0	0.0	0.0
S. SE AK.	0.6	6.8	0.1	1.1	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Muskeg	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1 cont. Capability of habitats to support mountain goats during the winter (i.e., November through March) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50° Slope)													
	Within 1300 ft (400 m)[a]						1300-2600 ft (400-800 m)						Greater Than 2600 ft	
	Aspect						Aspect							
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
Subalpine														
S. SE AK.	0.8	9.1	0.2	2.3	0.1	1.1	0.2	2.3	0.0	0.0	0.0	0.0	0.0	0.0
N. SE AK.	0.6	6.8	0.2	2.3	0.1	1.1	0.2	2.3	0.0	0.0	0.0	0.0	0.0	0.0
Clearcut	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2nd. growth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonforested														
Alpine														
S. SE AK.	0.3	3.4	0.1	1.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N. SE AK.	0.6	6.8	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
Avalanche Chutes	0.2	2.3	0.1	1.1	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Rock	0.5	5.7	0.2	2.3	0.1	1.1	0.2	2.2	0.1	1.1	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a]This habitat includes the cliff polygon.

[b]bf/ac = boardfeet/acre

[c]Density is expressed in number of animals/mi^2. The density of mountain goats in optimum habitat (i.e., Index = 1.0) is assumed to be 11.4/mi^2 (4.4/km^2) (Smith 1986; Smith and Bovee 1984).

APPENDIX

Table 1A. Capability of habitats to support mountain goats during spring (i.e., April - May) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50° Slope)													
	Within 1300 ft (400 m)[a] Aspect						1300-2600 ft (400-800 m) Aspect						Greater Than 2600 ft	
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
old-growth forest														
Conifer														
20,000+ bf/ac[b]														
S. SE AK.	0.9	10.3[a]	0.3	3.4	0.1	1.1	0.3	3.4	0.1	1.1	0.0	0.0	0.0	0.0
N. SE AK.	0.7	8.0	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
8-20,000 bf/ac														
S. SE AK.	0.7	8.0	0.2	2.3	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0
N. SE AK.	0.6	6.8	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Noncomercial	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1A cont. Capability of habitats to support mountain goats during spring (April - May) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50^{o} Slope)													
	Within 1300 ft (400 m)[a] Aspect						1300-2600 ft (400-800 m) Aspect						Greater Than 2600 ft	
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
Subalpine														
S. SE AK.	0.7	8.0	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
N. SE AK.	0.5	5.7	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
Clearcut	0.2	2.3	0.1	1.1	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0
2nd growth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonforest														
Alpine														
S. SE AK.	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N. SE AK.	0.3	3.4	0.1	1.1	0.0	0.0	0.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Avalanche Chutes	1.0	11.4	0.3	3.4	0.1	1.1	0.3	3.4	0.1	1.1	0.0	0.0	0.0	0.0
Rock	0.5	5.7	0.2	2.3	0.1	1.1	0.2	2.3	0.1	1.1	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a] Habitat includes the cliff polygon.

[b] bf/ac = boardfeet/acre

[c] Density is expressed in number of animals/mi^2. The density of mountain goats in optimum habitat (i.e., Index = 1.0) is assumed to be 11.4/mi^2 (4.4/km^2) (Smith 1986; Smith and Bovee 1984).

Table 2A. Capability of habitats to support mountain goats during summer and fall (June - October) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50^{o} Slope)												Greater Than 2600 ft	
	Within 1300 ft (400 m)[a] Aspect						1300-2600 ft (400-800 m) Aspect							
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
old-growth forest														
Conifer	0.1	0.6[b]	0.1	0.6	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous	0.2	1.2	0.2	1.2	0.2	1.2	0.1	0.6	0.1	0.6	0.1	0.6	0.0	0.0
Muskeg	0.1	0.6	0.1	0.6	0.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subalpine	0.9	5.4	0.9	5.4	0.9	5.4	0.3	1.8	0.3	1.8	0.3	1.8	0.0	0.0
Clearcut	0.3	1.8	0.3	1.8	0.3	1.8	0.1	0.6	0.1	0.6	0.1	0.6	0.0	0.0
2nd growth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2A cont. Capability of habitats to support mountain goats during summer and fall (June - October) in southeast Alaska by distance to cliff and aspect.

	Distance to Cliff (Greater than 50° Slope)													
	Within 1300 ft (400 m)[a]						1300-2600 ft (400-800 m)						Greater Than 2600 ft	
	Aspect						Aspect							
	SE-SW		E/W		NE-NW		SE-SW		E/W		NE-NW		(800 m)	
Habitat	Index	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den.	Ind.	Den
Nonforested														
Alpine	1.0	6.0	1.0	6.0	1.0	6.0	0.3	1.8	0.3	1.8	0.3	1.8	0.0	0.0
Avalanche Chutes	1.0	6.0	1.0	6.0	1.0	6.0	0.3	1.8	0.3	1.8	0.3	1.8	0.0	0.0
Rock	0.5	3.0	0.5	3.0	0.5	3.0	0.2	1.2	0.2	1.2	0.2	1.2	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a]Density is expressed in number of animals/mi^2. The density of mountain goats in optimum habitat (i.e., Index = 1.0) is assumed to be 6.0/mi^2 (2.3/km^2) during the summer and fall (Smith 1986; Smith and Bovee 1984).

HABITAT CAPABILITY MODEL FOR SITKA BLACK-TAILED DEER IN SOUTHEAST ALASKA: WINTER HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of Sitka black-tailed deer (Odocoileus hemionus sitkensis). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Only winter range is evaluated in the model because winter is assumed to be the most limiting season for Sitka black-tailed deer throughout the area (Hanley and McKendrick 1985).

Sitka black-tailed deer are indigenous to the coastal regions of southeast Alaska and northwest British Columbia. The subspecies occupies the northern-most extreme that black-tailed deer are able to tolerate (Regelin 1979). This situation may make these deer more sensitive to modification of their habitat than other populations of deer (Merriam 1970). These deer are the major big game species in southeast Alaska, providing meat and recreation through annual harvests of over 15,000 animals (Johnson and Wood). 1979; unpublished information, Alaska Department of Fish and Game). Deer also provide significant recreation opportunity for people who enjoy viewing wildlife (Langenan 1979). Both of these kinds of uses are expected to increase as tourism and human population size increases throughout southeast Alaska.

Habitat Use

Old-growth forests in southeast Alaska function to provide access to forage during periods of snow cover, thermal protection, and security or hiding places. Increasing snow depths makes survival for Sitka black-tailed deer increasingly difficult during winter (Hanley 1984). Shallow snow depths (up to 4 in - 10 cm) cover preferred forage (evergreen forbs and half-shrubs) in open areas. Increasing snow depth (over 12 in - 30 cm) impede movements and/or increase the energetic cost of locomotion. Alternative food sources (i.e., shrubs) may be covered by a deep snow pack. Old-growth stands which are dominated by tall, large-diameter trees with large branches provide a multi-layered, relatively closed canopy which ameliorates these effects of snow cover by intercepting snowfall (Hanley

and Rose 1987; Kirchhoff and Schoen 1987). These stands also support an understory of relatively abundant, high quality forage making them extremely valuable for deer (Hanley and McKendrich 1985). The combination of snow interception and the presence of a herbaceous and shrub understory ensures that forage will be available to deer in old-growth forests through all but the most severe winters.

Sitka black-tailed deer consume nearly 60 species of plants throughout their geographic range (numerous studies cited by Hanley 1984). The preferred winter forage of Sitka black-tailed deer is succulent evergreen half-shrubs and forbs, including bunchberry dogwood (<u>Cornus canadensis</u>), five-leaved bramble (<u>Rubus pedatus</u>), gold thread (<u>Coptis aspleniifolia</u>), foamflower (<u>Tiarella trifoliata</u>), and pyrola (<u>Pyrola secunda</u>) (Schoen and Wallmo 1979). As snow accumulates at high elevations and covers these preferred forage species, deer will move downslope (Schoen and Kirchhoff 1985). When these preferred plants are covered with snow throughout the deer's winter range, the deer rely primarily on <u>Vaccinium</u> spp. shrubs.

Arboreal lichens are also a preferred winter food in old-growth forests. The presence or absence of lichens in the diet of these deer apparently reflects their availability to deer. In some areas (e.g. Vancouver Island) lichens have been reported as one of the major constituents in the diet of black-tailed deer (Bunnell 1979). Lichens provide large amounts of energy and may enhance the

Digestibility of other food items (Rochelle 1980). Lichens are a particularly important source of energy for deer during intermediate to heavy snow winters because they are available as litterfall on top of the snow. Habitat characteristics that favor production of lichens appear to be related to increasing age of the forest (Hanley et al. 1984).

<u>Habitat Model</u>

The value of habitat for deer, under varying weather conditions, is directly related to the composition, structure, and productivity of vegetation on a site (Harestad 1985). During low snow conditions, when habitat selection by deer is not significantly influenced by snow, deer will select those habitats that provide the best foraging opportunities (Table 1). Under intermediate and deep snow conditions deer will select those habitats that provide for snow interception and food availability. The combination of a dense canopy with scattered openings in old-growth forests allows forage growth under openings while the canopy modifies snowfall sufficiently to promote forage availability and movement of deer. These characteristics are related to stands of western hemlock (<u>Tsuga</u>

heterophylla) and Sitka spruce (*Picea sitchensis*) with high volumes of timber (Hanley and Rose 1987; Kirchhoff and Schoen 1987). A corresponding preference has been demonstrated for these stands by deer with decreasing use in more open stands with lower timber volumes (Rose 1982; Schoen et al. 1985) Forested stands are assigned to volume classes ranging from forests without commercial value to high volume forests depending on the average net board-feet per acre in the stand (Table 2).

Structure and composition of vegetation show a predictable response following severe disturbance in a stand. Studies by Alaback (1982a, 1982b, 1984) on highly productive sites have shown growth responses of shrubby and herbaceous vegetation immediately following clearcutting. The first 10 years after logging show a dramatic increase in the production of plants which are primary food of deer in the winter. However, research findings indicate that forage species growing under the canopy of old-growth forests are more palatable to and nutritious for deer in southeast Alaska than the same species in clearcuts (Billings and Wheeler 1979; Rose 1982; Hanley et al. 1987). Shrubs begin to dominate clearcuts after 10 years, reducing forbs and half-shrubs that are preferred by deer. After 20 years the tree overstory begins to close, decreasing the amount of light reaching the forest floor resulting in a rapid reduction of understory biomass (Alaback 1984). A dense, closed-canopy forest with limited forage production persistsover the life of the timber rotation. An understory begins to develop again as stands reach 120 to 160 years of age. The value of these stands as deer habitat rises until about 250 to 300 years when old-growth conditions, and preferred deer habitat, are achieved once again.

The potential exists to extend the productivity for deer of 5 to 10 year old clearcuts for another 10 years by precommercial thinning of those stands at age 10 to 15 years (Kessler 1982, 1984). The greatest value of clearcut stands occurs during mild winters when the forage is available to deer. However, this forage becomes less available during moderate winters and is unavailable during severe winters (Bloom 1978). Treatment of slash (e.g., piling) is required following thinning to ensure that deer movement through the thinned stands is not impeded and that the increased forage is available to them (Hanley 1984). Parker et al. (1984) have demonstrated that when debris (such as that accumulated after thinning) exceeds 50 percent of brisket height the effort that deer must make to move through it increases dramatically. This depth is approximately 10 in (25 cm) for Sitka black-tailed deer (Hanley 1984).

Southerly aspects are exposed to much more potential solar radiation than northerly aspects during the winter in southeast Alaska (Hanley 1984). More forage is available to

deer on south aspects because snow melts faster than on north aspects. Deer are also better able to conserve body heat when they are on south aspects. In response to these factors slopes with southerly aspects are more valuable to deer in the fall, winter, and spring than slopes with northerly aspects (Hanley 1984).

Approximately 75 percent of the deer studied by Schoen and Kirchhoff (1985) migrated from low elevation winter ranges to summer ranges in alpine areas. The remaining 25 percent stayed in low elevation habitats throughout the year. The migrant deer tend to spend the winter at as high an elevation as snow conditions will allow. Schoen and Kirchhoff (1985) reported a mean elevation of 720 ft (220 m) for wintering deer during a low snow winter and 450 ft (136 m) during a deep snow winter. Forested winter range at lower elevations is, therefore, move valuable to deer than similar habitats at higher elevations where snow makes forage unavailable and movement difficult.

Coefficients were assigned to habitats in southeast Alaska as an index of their value to Sitka black-tailed deer during the winter based on these documented habitat use patterns (Tables 3-5). Values were assigned to old-growth western Hemlock/Sitka spruce forest (by volume class), non-commercial forest, clearcuts (0-25 years old), and second-growth forest (>25 years old) based on the work of Schoen et al (1985). Their values were scaled to a 0 to 1 base and were applied as reported, with one exception. Western hemlock/Sitka spruce, 20-30,000 board feet volume class, was considered more valuable during low snow conditions than the >30,000 board feet volume class. The rationale was that the snow interception capabilities of the higher volume class were not as significant to deer use during low snow conditions and that the more open, 20-30,000 board feet stands would have more forage production available to the deer.

Western hemlock/cedar (Alaska and Western red) forests were considered to provide the same habitat capability as western hemlock/Sitka spruce, 20-30,000 board feet class in terms of snow interception ability and forage production, so they were given equal value. Old-growth, Sitka spruce, riparian forests do not receive significant use by deer during the winter because forage production is limited and they tend to occur in cold-air drainages (Schoen et al. 1981). Their values are less than other old-growth stands for this reason. Deciduous riparian forests have little value to deer during the winter because of their inability to intercept snow and limited forage production. Nonforest (e.g., muskeg), mountain hemlock (Tsuga mertensiana), and alpine communities are assumed to not have any value as winter range for deer because of snow accumulations and lack of forage.

Southerly aspects (i.e., 67° to 290°) below 800 ft (244 m) provide the best potential for winter deer habitat. Coefficients for other aspect and elevation combinations were based on these values. Reductions in the coefficients for other combinations reflected greater snow accumulations and colder conditions. South aspects above 800 ft (244 m) were reduced 50 percent for forested stands. Clearcuts and noncommercial forest were given a value of 0 above 800 ft (244 m) on south aspects because of snow accumulations. South aspects above 1500 ft (460 m) were also assigned a value of 0. North aspects (i.e., 291° to 96°) below 800 ft (244 m) were reduced 20 percent. North aspects above 800 ft were reduced 60 percent for forested stands. Clearcuts and noncommercial forest were given a value of 0 above 800 ft (244 m) on north aspects because of snow accumulations. North aspects above 1200 ft (365 m) were also assigned a value of 0. Sites without measurable slope and aspect (i.e., slope $\leq 5^{\circ}$) are considered as having a north aspect.

Habitat Capability

The variation in carrying capacity of winter range for deer in southeast Alaska is related to the availability of forage. Availability of forage to deer is related to production of forage in the habitat and how much forage is covered by snow. Productive habitats under low snow conditions will support higher numbers of deer than less productive habitats or similar habitats under deep snow conditions. Estimates of population densities of deer were made from professional experience and the limited literature from southeast Alaska (e.g., Barrett 1979). Under low snow, intermediate snow, and deep snow situations deer carrying capacity is assumed to be 125 deer per mi^2 (0.5 deer per ha), 100 deer per mi^2 (0.4 deer per ha), and 50 deer per mi^2 (0.2 deer per ha) respectively for the habitats with the highest coefficients.

Predation can act as a significant controlling factor on deer populations (Keith 1974). This is especially true in those areas of southeast Alaska where gray wolves (*Canis lupus*) are present (Van Ballenberghe and Hanley 1984). Deer populations declined in Game Management Unit 3 from high densities to the lowest densities in southeast Alaska during the period 1968 to 1974 (Smith et al. 1986). The initial decline was due to severe winter weather with wolf populations limiting recovery of the deer population. This indicates a strong interaction between winter severity and the overall effect of wolf predation on deer. Predation on fawns by black bears may also be limiting deer numbers in this area. Although predation rates on deer by gray wolves and black bears are not known, it is assumed that deer populations will be reduced by 30 percent where these predators occur under deep snow conditions, 20 percent under

intermediate snow conditions, and 10 percent under low snow conditions (Tables 6-8).

Minimum Habitat Area

Minimum habitat area is defined as the minimum area of contiguous habitat that can support a wintering deer population on a reasonably long-term basis. This parameter has not been addressed in studies of deer and their habitat in southeast Alaska. However, it is reasonable to assume that as patch sizes of preferred winter habitats (i.e., high volume, old-growth forests) increase their suitability as habitat increases. Following this premise it is further assumed that contiguous patches of old-growth forest habitat (i.e., volume class 4+) 1,000 acres (400 ha) or larger provide optimum conditions for deer (Figure 1). Habitat capability of very small patches is reduced by 70 percent. A linear relationship is assumed between the two extremes.

Although it is not expressed quantitatively in this model, large contiguous habitat patches are more valuable to deer than long stringers of habitat that are connected even though the same area of forest habitat may be present.

The minimum area factor is to be applied after the habitat capability values of old-growth stands have been determined (i.e., from Tables 3-8). Habitat capability values determined for a stand are retained if the stand is part of a 1,000+ acre (400+ ha) block of habitat. If the stand is isolated or is associated with a habitat block that is less than 1,000 acres (400 ha) the habitat capability value is reduced according to the relationship established here (Figure 1).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Implementation of the minimum habitat area parameter will be assessed to determine its effect on habitat capability values.

Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on Sitka black-tailed deer. This will be done to ensure the model

results approximate the results of independent field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Categories of snow conditions in southeast Alaska.

Category	Days With >12 in (30 cm) snow on the ground	Mean Annual Snowfall - inches (cm)
Low	0	0 - 20 (0 - 50)
Intermediate	19	20 - 80 (50 - 200)
Deep	55	80 - 160 (200 - 400)

Table 2. Classes of timber volume on the Tongass National Forest, southeast Alaska.

Class Description	Range of Timber Volumes
Noncommercial forest	0 - 8,000 boardfeet/acre
Low-volume old-growth	8 - 20,000 boardfeet/acre
Mid-volume old-growth	20 - 30,000 boardfeet/acre
High-volume old-growth	30,000 + boardfeet/acre

Table 3. Capability of winter habitats, without predators, to support Sitka black-tailed deer under low snow conditions in southeast Alaska.[a]

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.7	88	0.4	50	0.0	0	0.6	75	0.3	38	0.0	0
Mid-vol.	1.0	125	0.5	63	0.0	0	0.8	100	0.4	50	0.0	0
High-vol.	0.9	113	0.4	50	0.0	0	0.7	88	0.4	50	0.0	0
Hemlock -cedar	1.0	125	0.5	63	0.0	0	0.8	100	0.4	50	0.0	0
Riparian												
Spruce	0.4	50	0.2	25	0.0	0	0.3	38	0.1	13	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.9	113	0.4	50	0.0	0	0.7	88	0.4	50	0.0	0
Noncommercial forest	0.4	50	0.0	0	0.0	0	0.3	38	0.0	0	0.0	0
2nd growth >25 years	0.1	13	0.1	13	0.0	0	0.1	13	0.0	0	0.0	0
Clearcut 0-25 yrs.	0.5	63	0.0	0	0.0	0	0.4	50	0.0	0	0.0	0
Thinned clearcut	0.6	75	0.0	0	0.0	0	0.5	63	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a]Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

Table 4. Capability of winter habitats, without predators, to support Sitka black-tailed deer under intermediate snow conditions in southeast Alaska.

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.3	38	0.1	13	0.0	0	0.2	25	0.1	13	0.0	0
Mid-vol.	0.5	63	0.2	25	0.0	0	0.4	50	0.2	25	0.0	0
High-vol.	0.8	100	0.4	50	0.0	0	0.6	75	0.3	38	0.0	0
Hemlock -cedar	0.5	63	0.2	25	0.0	0	0.4	50	0.2	25	0.0	0
Riparian												
Spruce	0.2	25	0.1	13	0.0	0	0.1	13	0.1	13	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.8	100	0.4	50	0.0	0	0.6	75	0.3	38	0.0	0
Noncommercial forest	0.1	13	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
2nd growth >25 years	.1	13	0.1	13	0.0	0	0.1	13	0.0	0	0.0	0
Clearcut 0-25 yrs.	.2	25	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Thinned clearcut	0.2	25	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a] Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

Table 5. Capability of winter habitats, without predators, to support Sitka black-tailed deer under deep snow conditions in southeast Alaska.[a]

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.2	25	0.1	13	0.0	0	0.2	13	0.0	0	0.0	0
Mid-vol.	0.3	38	0.2	25	0.0	0	0.2	25	0.1	13	0.0	0
High-vol.	0.4	50	0.3	38	0.0	0	0.3	38	0.2	25	0.0	0
Hemlock -cedar	0.3	38	0.2	25	0.0	0	0.2	25	0.1	13	0.0	0
Riparian												
Spruce	0.1	13	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.4	50	0.2	25	0.0	0	0.3	38	0.2	25	0.0	0
Noncommercial forest	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
2nd growth >25 years	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Clearcut 0-25 yrs.	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Thinned clearcut	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a]Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

Table 6. Capability of winter habitats, with predators, to support Sitka black-tailed deer under low snow conditions in southeast Alaska.

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.7	88	0.3	38	0.0	0	0.5	63	0.0	0	0.0	0
Mid-vol.	0.9	113	0.4	50	0.0	0	0.7	88	0.3	38	0.0	0
High-vol.	0.8	100	0.4	50	0.0	0	0.6	75	0.3	38	0.0	0
Hemlock -cedar	0.9	113	0.4	50	0.0	0	0.7	88	0.3	38	0.0	0
Riparian												
Spruce	0.3	38	0.2	25	0.0	0	0.2	25	0.1	13	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.8	100	0.4	50	0.0	0	0.6	75	0.3	38	0.0	0
Noncommercial forest	0.3	38	0.0	0	0.0	0	0.2	25	0.0	0	0.0	0
2nd growth >25 years	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Clearcut 0-25 yrs.	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Thinned clearcut	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a]Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

Table 7. Capability of winter habitats, with predators, to support Sitka black-tailed deer under intermediate snow conditions in southeast Alaska.

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi	Index	# sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.3	38	0.1	13	0.0	0	0.2	25	0.0	0	0.0	0
Mid-vol.	0.4	50	0.2	25	0.0	0	0.3	38	0.1	13	0.0	0
High-vol.	.6	75	0.3	35	0.0	0	0.5	63	0.2	25	0.0	0
Hemlock -cedar	0.4	50	0.2	25	0.0	0	0.3	38	0.1	13	0.0	0
Riparian												
Spruce	0.1	13	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.6	75	0.3	38	0.0	0	0.5	63	0.2	25	0.0	0
Noncommercial forest	0.1	13	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Second growth >25 yrs.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Clearcut 0-25 yrs.	.1	13	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Thinned clearcut	0.2	25	0.0	0	0.0	0	0.1	13	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a]Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

Table 8. Capability of winter habitats, with predators, to support Sitka black-tailed deer under deep snow conditions in southeast Alaska.

	Physiographic Features											
	South Aspect						North Aspect					
	<800 ft		>800 ft		>1500 ft		<800 ft		>800 ft		>1200 ft	
Habitat	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi	Index	# / sq mi
old-growth												
Hemlock-spruce, hemlock												
Low-vol.	0.1	13	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Mid-vol.	0.2	25	0.1	13	0.0	0	0.1	13	0.0	0	0.0	0
High-vol.	.3	38	0.2	25	0.0	0	0.2	25	0.1	13	0.0	0
Hemlock -cedar	0.2	25	0.1	13	0.0	0	0.1	13	0.0	0	0.0	0
Riparian												
Spruce	0.1	13	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Deciduous	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Spruce (upland)	0.3	38	0.2	25	0.0	0	0.2	25	0.1	13	0.0	0
Noncommercial forest	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Second growth >25 yrs.	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Clearcut 0-25 yrs.	.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Thinned clearcut	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Other	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0

[a]Number of deer per mi^2 was calculated by reducing densities associated with optimum conditions (i.e., 125 deer per mi^2) by the factors described in the text for less than optimum conditions. Associated index numbers, which were calculated through the same process, were rounded to the nearest tenth.

HABITAT CAPABILITY MODEL FOR RIVER OTTER IN SOUTHEAST ALASKA: SPRING HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of river otter (Lutra canadensis). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Habitat capability is determined for spring (May through July) because river otters make use of all occupied habitats at this time.

The historic range of the river otter includes the majority of the North American continent (Hall and Kelson 1959). Population declines and extripations of the river otter followed human settlement and associated habitat alteration and overharvest through trapping (Jenkins 1983). River otters still occur in 44 states and 11 Canadian provinces and territories (Deems and Pursley 1978). Other areas (e.g., Colorado) are attempting to reestablish populations of river otters. Populations of river otters are stable or may be increasing in Alaska (Endangered Species Scientific Authority 1978). Magoun and Valkenburg (1979) have reported a northward expansion of the range of river otters in Alaska. The river otter has been an important source of income for trappers throughout North America including Alaska. River otter harvests are increasing throughout Alaska with over 430 pelts taken in southeast Alaska in 1983-1984 (Townsend 1986).

Habitat Use Information

River otters have adapted to a range of habitats throughout North America but they are always closely associated with aquatic environments. Coastal habitats are especially productive because of the variety and abundance of food items available for river otters (Larsen 1984; Stenson et al. 1984). Habitat selection by river otters along the coastline in southeast Alaska appears to be related to the availability of food resources and adequate cover (Larsen 1983; Woolington 1984). Beaches characterized by convex shorelines, short intertidal lengths, and the presence of bedrock substrate were selected by otters in response to presence and availability of prey. Cottids, Scorpaenids, and Hexagrammids occurred most frequently in otter diets in southeast Alaska (Larsen 1984). These fish often occur in

intertidal areas with fairly steep beaches which are often located adjacent to convex shorelines (Hart 1973). River otters hauling out on and crossing beaches with short intertidal lengths with rocky substrates are less exposed to potential predators than they would be on beaches with long intertidal lengths with a fine particulate substrate.

Although beach characteristics affected river otter use of habitats, river otters did not utilize beaches with preferred foraging characteristics when these areas were adjacent to clearcuts (Larsen 1983). Five to 20 year old clearcuts were used less than expected by river otters while forested habitats were used in proportion to availability. This was apparently due to dense shrub growth, extensive slash, and lack of an overstory canopy in clearcuts. River otters in southeast Alaska tended to select areas for use that were relatively free from extensive vegetative debris and dense shrub growth and with a canopy closure of >50 percent.

River otters in southeast Alaska made extensive use of natural cavities near (within 75 ft - 23 m) the beach as daytime resting sites (Larsen 1983). The burrows most often used were formed by the roots of conifer trees and decaying snags. Cavities under snags were used as burrows more often than any other structures. The mean diameter at breast height of all trees and snags associated with cavities used as burrows was 34 in (85 cm).

Throughout most of the year the majority of river otter activity occurs within 100 ft (30 m) of the shoreline (Larsen 1983; Woolington 1984). However, from May through July female river otters use inland habitats generally within 0.5 mi (0.8 km) of the coastline as natal denning sites (Woolington 1984). Natal dens occurred on well drained sites near streams in old-growth habitats. Stream courses were used as travel corridors between natal den sites and foraging areas on the coastline.

A proportion of river otters periodically move into inland habitats associated with streams and lakes (Home 1982; Larsen 1983; Woolington 1984). Otter apparently travel extensively throughout stream and lake systems utilizing areas with greatest food availability (Melquist and Hornocker 1983). Streams in southeast Alaska support populations of sculpins (Cottus spp.) which are the preferred food item of river otters in this area (McLarney 1968, Mason and Machidori 1975, Larsen 1984).

Habitat Model

Although availability of food directly affects use of habitats by river otters,adequate cover appears to be required before otters will extensively use an area.

Characteristics associated with food availability in marine systems (e.g., convex shoreline, short intertidal zone) are not easily represented in habitat databases. For these reasons the emphasis in this model is placed on the cover and spatial relationships between river otters and their habitat, rather than food availability. This is recognized as a shortcoming of this model.

Coastal Habitats

old-growth forests are assumed to provide optimum habitat for river otters (Table 1). This habitat encompasses the characteristics selected by river otters in southeast Alaska. These characteristics include >50 percent canopy cover, large diameter trees and snags, and availability of burrow and den sites. These characteristics start to become available in stands of sawtimber but adequate den and burrow sites are limited. Seedling and sapling (i.e., clearcut) and pole timber stands provide limited habitat for river otters. Adequate den and burrow sites are not available in these stands, slash accumulations limits mobility of river otters, and canopy cover is not extensive enough in clearcuts. Other vegetation communities are assumed not to have any value for river otters because of lack of cover and the absence of suitable burrow and den sites.

Use of coastal habitats by river otters was usually restricted to a 65 ft (20 m) fringe of forest during Larsen's (1983) study. Woolington (1984) reported 75 percent of radio locations of radio-equipped river otters occurred within 100 ft (30 m) of the shoreline with rapidly decreasing use as distance increased. These findings indicate that the 100 ft (30 m) fringe of forest adjacent to the coastline is optimum habitat for river otters (Table 1). Approximately 10 percent of total use occurred from 100 ft (30 m) to 500 ft (150 m) from the shoreline. This zone is assumed to encompass all coastal habitats used by river otters. Stands located greater than 500 ft (150 m) from mean high tide, other than riparian areas and natal denning sites, were assumed to not have any value as habitat for river otter.

Stream and Lake Habitat

Streams in southeast Alaska have been classified to characterize their potential as aquatic habitat. Streams that produce anadromous and resident fish (i.e., classes I and II) are assumed to be good foraging habitat for river otters (Table 1). Streams that do not support any fish (i.e., class III) are assumed not to have any foraging value for river otters. Lakes greater than 50 ac (20 ha) are assumed to support more prey for river otters and provide more foraging opportunities than smaller lakes.

Utilization of inland areas by river otters is strongly associated with streams, lakes, and their associated riparian habitats (Melquist and Hornocker 1983). Riparian habitats have been described on the Tongass National Forest on the basis of channel type, soil, land form, and vegetation (Martin et al. 1986). Use of inland areas by river otters is assumed to be restricted to these riparian areas (Table 1). The vegetation/successional stage relationships established for river otter in coastal habitats are assumed to also apply to riparian habitats.

Natal Denning Habitat

Natal dens located by Woolington (1984) ranged from 0.15 mi (0.25 km) to 0.5 mi (0.8 km) inland from saltwater. These sites were in well-drained riparian habitats or in the adjacent upland area (i.e., within 100 ft [30 m]). Information on specific elevation parameters already existed in the Geographic Information System (GIS) database and is easier to apply than distance buffers. For this reason an elevation value was substituted for the distance parameter (i.e., 0.5 mi [0.8 km]) described in Woolington's (1984) description of natal denning sites.

old-growth forests, on well-drained soils, adjacent to streams, up to 800 ft (245 m) elevation are therefore considered optimum natal denning habitat for river otters (Table 1). Forested stands from 800 ft (245 m) to 1200 ft (365 m) elevation have limited value as natal denning sites. Stands more than 1200 ft (365 m) elevation are not considered natal denning habitat even when they are adjacent to streams. Natal dens were only found in old-growth stands so the vegetation/successional relationships established for the beach fringe habitat were assumed to also apply here.

Habitat Capability

Densities of river otters in southeast Alaska have been estimated to be 1 river otter per 1.28 mi (2.06 km) of coastline (Home 1982), 1 river otter per 1.24 mile (2.00 km) (Larsen 1983), and 1 river otter per 0.73 mile (1.18 km) (Woolington 1985). The mean of these 3 estimates is 1 river otter per 1.08 mi (1.75 km) or approximately 1 river otter per 1 mile (1.61 km) of coastal shoreline. The following calculations provide an estimate of the area of river otter habitat per linear measurement of coastline.

$$\frac{5280\ \text{ft (1 mile)} \times 500\ \text{ft (beach fringe)}}{43560\ \text{ft}^2/\text{ac}} = 60\ \text{ac/mi of beach fringe}$$

500 ft (150 m) is used as the depth of beach fringe because most river otter use occurs within this zone.

1 river otter per mile of coastline = 1 river otter/60 ac = 0.02 river otter/ac = 13 river otter/mi^2.

An even (i.e., 1:1) sex ratio has been assumed for river otters (Toweill and Taber 1982). This indicates an estimate of 6.5 female river otter/mi^2.

The reported proportion of female river otters breeding annually varies. The average proportion from 3 studies suggests that approximately 85 percent of female river otters breed each year (Tabor and Wight 1977; Lauhachinda 1978; Mowbray et al. 1979).

0.85 x 6.5 female river otter/mi^2 = 5.5 female river otters/mi^2 of natal denning habitat.

It is assumed that 20 percent of the remaining 7.5 river otters/mi^2 are utilizing inland aquatic and riparian habitats during spring.

0.20 x 7.5 river otter/mi^2 = 1.5 river otter/mi^2 of inland aquatic and riparian habitat.

7.5 river otter/mi^2 beach fringe habitat - 1.5 river otter/mi^2 using inland aquatic and riparian habitat = 6 river otter/mi^2 remaining in beach fringe habitats during spring.

These calculations provide the following springtime estimates of river otter population densities in optimum habitats (i.e., suitability index = 1.0):

Marine coastal habitat = 6 river otter/mi^2
Natal denning habitat = 5.5 river otter/mi^2
Inland aquatic/riparian habitat = 1.5 river otter/mi^2

Unsuitable habitat (i.e., suitability index = 0.0) is assumed to have a density of 0 river otter/mi^2. A linear relationship is assumed between river otter densities and habitat quality, as defined by index values, in order to calculate densities for intermediate index values (Table 1).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the GIS database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that

the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on river otters. This will be done to ensure the model results approximate the results of field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Capability of habitats to support spring populations of river otters in southeast Alaska.

Habitat / Volume Class / Food Production	Distance From Saltwater <500 ft: Index	<500 ft: # sq mi	>500 ft, Riparian, Elevation <800 ft: Index	<800 ft: # sq mi	800-1200 ft: Index	800-1200 ft: # sq mi	>1200 ft: Index	>1200 ft: # sq mi	Not Riparian: Index	Not Riparian: # sq mi
old-growth forest										
Volume class 4+	1.0	6.0							0.0	0.0
Stream-class I & II[a]			1.0	6.0	0.3	1.8	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.3	1.8	0.1	0.6	0.0	0.0		
->50 ac			0.8	4.8	0.2	1.2	0.0	0.0		
Noncommercial	0.1	0.6							0.0	0.0
Stream-class I & II			0.1	0.6	0.0	0.0	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.0	0.0	0.0	0.0	0.0	0.0		
->50 ac			0.1	0.6	0.0	0.0	0.0	0.0		
Clearcut	0.1	0.6								
Stream-class I & II			0.1	0.6	0.0	0.0	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.0	0.0	0.0	0.0	0.0	0.0		
->50 ac			0.1	0.6	0.0	0.0	0.0	0.0		
Pole timber	0.1	0.6							0.0	0.0
Stream-class I & II			0.1	0.6	0.0	0.0	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.0	0.0	0.0	0.0	0.0	0.0		
->50 ac			0.1	0.6	0.0	0.0	0.0	0.0		
Young growth sawtimber	0.3	1.8							0.0	0.0
Stream-class I & II			0.3	1.8	0.1	0.6	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.0	0.0	0.0	0.0	0.0	0.0		
->50 ac			0.2	1.2	0.1	0.6	0.0	0.0		

Table 1. (Continued) Capability of habitats to support spring populations of river otters in southeast Alaska.

Habitat Volume Class Food Production	Distance From Saltwater <500 ft Index	# sq mi	>500 ft Riparian Elevation <800 ft Index	# sq mi	800-1200 ft Index	# sq mi	>1200 ft Index	# sq mi	Not Riparian Index	# sq mi
Other	0.0	0.0							0.0	0.0
Stream-class I & II			0.0	0.0	0.0	0.0	0.0	0.0		
-class III			0.0	0.0	0.0	0.0	0.0	0.0		
Lake -<50 ac			0.0	0.0	0.0	0.0	0.0	0.0		
>50 ac			0.0	0.0	0.0	0.0	0.0	0.0		

[a]Class I streams support populations of anadromous fish
Class II streams support populations of resident fish
Class III streams do not support fish populations

HABITAT CAPABILITY MODEL FOR MARTEN IN SOUTHEAST ALASKA: WINTER HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of marten (Martes americana). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. This model was developed to evaluate the potential quality of winter habitat for marten. The winter cover requirements of this species are more restrictive than the cover requirements during other seasons of the year and availability of prey (Allen 1982). It is assumed that if adequate winter cover is available, habitat requirements throughout the balance of the year will not be limiting.

The marten is generally considered to be an inhabitant of climax forest communities throughout North America (Marshall 1951). The species prefers mature conifer or mixed forest stands although there are indications that it may be adaptable to a variety of forest habitats (Soutiere 1979). Use of habitat by marten is related to occurrence and availability of foods and to cover characteristics.

Extensive old-growth forests have been called the mainstay of marten populations in the Pacific states because they provide many den sites and abundant prey items (Meslow et al. 1981).

Marten have been eliminated throughout the southern and eastern portions of their original range (Strickland et al. 1982). This has been attributed to overharvesting and removal of mature forests through logging (Bergerud 1969; Dodds and Martell 1971; Strickland et al. 1982). Marten populations throughout southeast Alaska continue to be "reasonably dense" (Johnson 1981). However, very little is known of specific habitat associations in this area.

Habitat Use

Food

The food habits of marten have been studied extensively and are similar throughout their range, where studied (Marshall 1946; Cowan and MacKay 1950; Lensink et al. 1955; Quick 1955; Murie 1961; Weckwirth and Hawley 1962; Francis and

Stephenson 1972; Goszczynski 1976; Koehler and Hornocker 1977; Campbell 1979; Soutiere 1979; Zielinski et al. 1983; Buskirk and MacDonald 1983). Marten utilize food from four general categories: small mammals, birds, insects, and fruit.

The red-backed vole (Clethrionomys spp.) is the staple food source throughout the year but is most important during winter, where it occurs. The meadow vole (Microtus pennsylvanicus) appears to be a preferred food but may be generally unavailable to marten because their habitats do not overlap extensively. Deer mice (Peromyscus spp.) are abundant throughout marten habitat but are not well represented in food habits studies. Food habits studies have shown conflicting results concerning the use of red squirrels (Tamiasciurus hudsonicus) by marten. Several studies indicated that red squirrels are not preferred by marten. Other studies have reported that, at times, tree squirrels may be important to marten. The limited distribution of red-backed voles in southeast Alaska may result in dependence of marten on red squirrels in this area. The occurrence of birds and their eggs increases in the diet of marten in June and July when they are most vulnerable to marten. Fruits and berries make up a large part of the diet of marten in late summer when they become available. An increase in the occurrence of insects in the diet of marten also takes place in the summer.

Water

The requirements of water for marten have not been directly addressed in the literature. However, some inferences may be made from other observations. Marten have been reported to immediately seek water to drink after being released from live traps (Hawley 1955; Lensink et al. 1955). The distribution of the red-backed vole, the marten's major prey item, is closely associated with the presence of free water (Gunderson 1959). Marten have also been reported to select drainages and timber stands with moist areas for hunting sites (Simon 1980). These findings tend to indicate that habitat selection by marten may be influenced by the availability of free water. This association has not been quantified. However, water is probably not limiting in the wet climate of southeast Alaska.

Cover

Habitat use by marten has been related to very specific vegetation related attributes of the landscape. Numerous studies have reported the relationship between canopy cover and habitat preferred by marten. Koehler and Hornocker (1977) indicated that marten required at least a 30 percent canopy closure in Idaho. Spencer et al. (1983) reported that habitats in the northern Sierra Nevada with 40 to 60

percent canopy closure were preferred and that habitats with 30 percent or less canopy closure were avoided. The results of a study in eastern Canada indicated that marten prefer dense conifer forest in the winter with a canopy closure greater than 75 percent (Bateman 1986). Hargis and McCullough (1984) further indicated that marten prefer areas with 100 percent cover. However, marten have also been reported to avoid dense stands (i.e., >60 percent crown closure) because of the lack of habitat for prey in these areas (Spencer 1981).

Conversely, marten avoid open habitats without tree canopy cover even though these areas often provide the best habitat for their preferred prey species (i.e., meadow vole) (Hawley and Newby 1957; Martell and Radvaryi 1977; Spencer 1981; Douglass et al. 1983). Spencer et al. (1983) reported that marten rarely went more than 30 feet (10 m) into treeless meadows. Ingram (1973) and Simon (1980) indicated that marten seldom penetrate more than 100 feet (30 m) into openings. Hargis and McCullough's (1984) observations indicated that marten would directly cross openings up to 160 feet (50 m) in width, but that they would not stop to rest or hunt. Openings up to 440 feet (135 m) across were traversed by martens if scattered islands of trees were available. Similar observations were reported by Koehler and Hornocker (1977), Spencer (1981), and Bateman (1986). They observed marten crossing clearcuts up to 330 feet (100 m) across with scattered trees and treeless openings up to 200 feet (60 m) across. Soutiere (1979) and Pulliainen (1981) both indicated that marten occasionally crossed openings up to 670 feet (200 m) across. Avoiding openings and traveling under the tree canopy may minimize the risk of predation for marten (Herman and Fuller 1974; Pulliainen 1981). It has also been suggested that deep snow in openings in winter may preclude successful hunting by marten (Koehler and Hornocker 1977; Soutiere 1979). The dense growth in clearcut openings in the summer may also hinder the marten's visual contact with prey and also provide escape cover for prey species, thus reducing foraging efficiency for marten (Steventon and Major 1982).

Special Habitat Characteristics

Snags are important to marten to provide dens for resting in both winter and and summer (Spencer 1987). Marten utilize the tops of broken snags as resting sites in the summer and cavities in snags in the winter and summer (Campbell 1979; Wynne and Sherburne 1984). The presence of snags is so critical to the well being of marten that Schmidt (1943) and Bergerud (1969) indicated that den site availability may limit marten populations. Marten tend to utilize large diameter, highly decayed snags as den sites (Cambell 1979; Spencer 1981). Preferred snags have been reported to range from 16 to 58 inches (40 to 147 cm) diameter at breast

height (dbh) (Cambell 1979; Simon 1980; Spencer et al. 1983; Wynne and Sherburne 1984; Spencer 1987). All snags known to be used by marten during one study were sheltered, at least partially, by the overstory canopy (Simon 1980).

During periods of snow cover marten forage for prey almost exclusively under the snow where this aspect of their life history was studied (Murie 1961; Zielinski 1981; Buskirk 1983). They utilize down woody material extending above the snow to gain access to prey under the snow (Hargis and McCullough 1984). Many of the marten's preferred prey species also depend upon downed wood for food storage locations and den sites (Maser et al. 1979). Marten also use down logs and other woody debris covered by snow as den sites (Cambbell 1979; Spencer 1987). Marten avoid areas with little or no down woody material whether or not other cover requirements are met (Simon 1980). Dead and declining trees are therefore a necessary component of productive marten habitat (Wynne and Sherburne 1984).

Although marten can effectively use down woody material to forage under snow, the greater the depth of snow the more difficult it will be for marten to obtain food. At high elevations in southeast Alaska (i.e., >1,500 feet [460 m]) excessive snow depth may preclude marten activity. The high moisture content of snow in southern southeast Alaska may also reduce or preclude foraging under the snow. Habitat suitability may, therefore, decrease as elevation increases.

Interspersion of Habitats

Habitat selection by marten is driven by optimization of foraging success and minimization of danger and discomfort (Spencer 1981). Habitat of high quality for marten is a mosaic of plant communities (Buskirk 1983). This mosaic is best provided by uneven aged forests with an interspersion of patches of old-growth trees and small openings. Such forests provide habitat for prey species and the protective cover that is important for marten.

Habitat Model

The distribution and abundance of marten are determined to a large extent by the availability of cover and the presence of prey species (Simon 1980). A critical component of cover for marten, described by a number of studies, is canopy cover. Marten prefer habitats with canopies apparently for predator avoidance and other survival benefits. However, complete canopy closure results in a depletion of habitat for the marten's preferred prey species. The minimum canopy closure suitable for marten appears to be 30 percent (Koehler and Hornocker 1977). Optimum canopy closure ranges from 60 percent to 80 percent (Spencer et al. 1983; Bateman 1986). As canopy closure approaches 100 percent the value

of marten habitat declines (Spencer 1981; Spencer et al. 1983). Measurements of overstory canopy closure are often not available, so alternate variables are necessary to express this relationship. A significant positive relationship has been demonstrated between canopy closure and timber volume ($r=0.81$, $P < 0.01$) based on data provided in Martin et al. (1985).

A number of studies have described the relationship between high quality marten habitat and the presence of snags (e.g., Simon 1980; Spencer et al. 1983; Wynne and Sherburne 1984; Spencer 1987). Snags typically used by marten as resting and den sites have a large diameter, often have a broken top, and are sheltered by the overstory canopy. Noble and Harrington (1981) completed an extensive survey of snag characteristics on Prince of Wales Island in southern southeast Alaska. Information from that survey indicates that stands of commercial forest (i.e., hemlock, spruce, hemlock/spruce) have higher densities of snags preferred by marten than other forest stands (i.e., noncommercial forest, muskeg forest).

Another important component of marten habitat that has been identified by numerous studies is dead and down woody material (e.g., Simon 1980; Steventon and Major 1982; Spencer et al. 1983; Hargis and McCullough 1984; Spencer 1987). Marten utilize dead and down material to gain access to prey under the snow and for den sites. Stand surveys completed in southeast Alaska currently do not provide information on density or presence of dead and down material. However, Brown and See (1981) have demonstrated a relationship between amount of dead and down material and productivity of a site. Their findings indicate that deposition of downed dead woody material generally increases with an increase in site productivity (i.e., the more productive sites grow more woody biomass for accumulation as downed woody material). Site index is also related to the volume of timber a stand produces (i.e., higher volume classes occur on areas with higher site index).

Timber volume classes may, therefore, be used to indicate degree of canopy closure, availability of suitable snags, and the presence of dead and down material in old-growth forests and their associated value as habitat for marten (Table 1).

Stand age, as represented by stand size class, also has a significant effect on the suitability of habitat for marten. A portion of this effect is related to the development of canopy cover. Canopy development can be predicted, to an extent, from the age of a stand on highly productive sites (Alaback 1984). Numerous studies have shown that clearcutting is detrimental to marten populations (de Vos 1951, 1952; Grakou 1972; Steventon and Major 1982;

Snyder and Bissonette 1987). Clearcutting lowers the carrying capacity of an area for marten, resulting in larger home range sizes and lower population densities (Soutiere 1979). This results from an elimination of resting sites, winter hunting sites, overhead cover, and preferred prey species (Campbell 1979). Red-backed voles, the staple food source of martens in areas where these voles are present, are abundant in undisturbed forests, avoid forest openings, and are rare or absent for at least 10 years following clearcutting (Miller and Getz 1972; Powell 1972; Martell and Radvaryi 1977; Campbell 1979). Red squirrels appear to follow similar trends (Wolff and Zasada 1975; Medin 1986). Populations of small mammals not preferred by marten (e.g., deer mice) generally increase in clearcut areas (Tevis 1956; Campbell 1979; Van Horne 1981). These factors indicate that the suitability of clearcuts as marten habitat is low (Table 2). Some habitat value for marten is retained in clearcuts in that residual slash provides overhead cover and some less-preferred prey species are available.

The dense overstory that develops at approximately age 25 and persists until the next rotation at age 100 decreases the amount of light that reaches the forest floor and results in a rapid depletion of the understory vegetation. Understory vegetation provides habitat for the primary prey species of the marten. Reduction in prey populations in second growth stands results in significant reductions of marten populations (de Vos 1952; Koehler et al. 1975) (Table 2).

Habitats within the beach fringe (i.e., 500 ft [150 m] of the beach) and to some extent within riparian zones have higher value for marten than upland habitats. The presence of 1) marine and aquatic organisms as a food source, 2) undercut banks for dens and burrows, 3) a deciduous tree layer, grasses, and sedges as habitat for prey species, and 4) increased dead and down material resulting from blowdown are assumed to make these habitats more valuable for marten, based on field experience (Table 3).

Availability of prey items for marten may decrease as snow depth increases, especially with elevation. Elevation, therefore, influences the quality of habitat for marten (Table 4).

Timber harvest and other resource development activities require the construction of roads. These roads provide additional access for trappers which usually results in increased harvests of marten. Marten are easily trapped and can be overharvested, especially where trapping pressure is heavy (Strickland et al. 1982). Density of roads may affect the quality of habitat for marten through trapping, especially where there is potential of overtrapping. Mean home range sizes reported for marten are approximately 1

mi^2 (2.6 km^2) (Strickland et al. 1982). Home ranges of males tend to be descrete but they overlap with the ranges of 1 or more females. Therefore, whenever roads are built within 2 mi (3.2 km) of the beach or built less than 2 mi (3.2 km) apart a high risk exists that unregulated trapping on these roads will result in an overharvest of resident marten. It is assumed, therefore, that as road densities exceed 0.2 mi/mi^2 densities of marten will decrease (Figure 1). At road densities approach 0.6 mi/mi^2 marten densities will be reduced by 90 percent due to greatly increased trapping pressure.

Equations.--In order to obtain a life requisite value for marten for each habitat the individual Suitability Index values for appropriate variables must be combined. This is accomplished in this model by multiplying appropriate Suitability Index values together for a site to obtain the overall index value (Table 5).

Habitat capability.--The harvest density of marten on Prince of Wales Island in southern southeast Alaska has recently been estimated to be 0.8 marten/mi^2 (0.3 marten/km^2) (Alaska Department of Fish and Game, unpublished data). The proportion of a population of marten that may be harvested on a sustained yield basis has been estimated to be at least 40 percent (Quick 1956). Assumming that a harvest of 0.8 marten/mi^2 (0.3 marten/km^2) approximates 40 percent of the population, the total density on Prince of Wales Island is 2 marten/mi^2 (0.8 marten/km^2) (i.e., 0.8 marten/mi^2/0.40 = 2 marten/mi^2 [0.3 marten/km^2/0.40 = 0.8 marten/km^2]). A mean density of 2 marten/mi^2 (0.8 marten/km^2) is therefore assummed in southeast Alaska.

This density was used to calibrate the model on a 136.6 mi^2 (35,380 ha) area in the interior of Prince of Wales Island. When optimum habitat (i.e., suitability index = 1.0) was assumed to support a population of 4 marten/mi^2 (1.6 marten/km^2) the model projected an overall density of 1.95 marten/mi^2 (0.76 marten/km^2). This approximates the estimated density of the area based on harvest estimates. Density of marten in optimum habitats is therefore assummed to be 4.0 marten/mi^2 (1.6 marten/km^2) (Table 5).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on marten. This will be done to ensure the model results approximate the results of independent field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Classes of timber volume in old-growth forests in southeast Alaska and associated habitat suitability values for marten.

Range of Timber Volume (bf/acre)	Volume Class	Habitat Suitability Value
<8,000	3 (i.e., noncommercial forest)	0.3
8-20,000	4	0.7
20-30,000	5	1.0
>30,000	6+	1.0

Table 2. Description of stand size classes (i.e., stand age) for forests in southeast Alaska and associated habitat suitability values for marten.

Stand Size Class	Description	Habitat Suitability Value
Seedling or Sapling	Trees <5 in (13 cm) dbh	0.2
Poletimber	Trees >5 in (13 cm) dbh, <9 in (23 cm) dbh	0.1
Young growth sawtimber	Trees >9 in (23 cm) dbh, <150 years old	0.1

Table 3. Suitability of beach fringe[a] and riparian areas as habitat for marten.

Habitat Description	Habitat Suitability Value
Beach fringe	1.0
Riparian	1.0
Upland	0.9

[a]Beach fringe habitats are those within 500 ft (150 m) of the mean high tide line.

Table 4. The effect of elevation on the suitability of habitats for marten in southeast Alaska.

Elevation	Habitat Suitability Values
<800 ft (245 m)	1.0
800-1500 ft (245-560 m)	0.6
>1500 ft (560 m)	0.0

Table 5. Suitability of habitats in southeast Alaska for marten[a].

Winter Habitat	<800 ft (245m) Beach/Riparian Index	<800 ft (245m) Beach/Riparian #/sq mi	<800 ft (245m) Upland Index	<800 ft (245m) Upland #/sq mi	800-1500 ft (245-560 m) Index	800-1500 ft (245-560 m) #/sq mi	>1500 ft (560 m) Index	>1500 ft (560 m) #/sq mi
Seedling or sapling	0.20	0.80	0.18	0.72	0.12	0.48	0.00	0.0
Poletimber	0.10	0.40	0.09	0.36	0.06	0.24	0.00	0.0
Young growth sawtimber	0.10	0.40	0.09	0.36	0.06	0.24	0.00	0.0
old-growth								
Noncommercial forest	0.30	1.20	0.27	1.08	0.14[b]	0.56	0.00	0.0
Volume class 4	0.70	2.80	0.63	2.52	0.43	1.72	0.00	0.0
Volume class 5+	1.00	4.00	0.90	3.60	0.60	2.40	0.00	0.0
Nonforest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0

[a]Table entries under Index are the products of the individual suitability index values for the habitat components listed in Tables 1-4.

[b]The value for noncommercial forest between 800 and 1500 ft (245 and 560 m) was considered to be lower than the products indicated because of the accumulation of snow at this elevation and the lack of down and dead woody material.

Brown Bear: Brown bear is another species in which the public is highly interested. Their economic value is high, and their populations are perceived to be affected by forest management activities. They are also used as a subsistence species. Brown bear use habitats from sea level to alpine and require large expanses of habitat and protection from human disturbances. Brown bear are found on some islands in Southeast Alaska where black bear are not present. Threatened in the lower 48 States-- Brown bear are a national conservation issue. Some of the highest brown bear population densities in the world are found on the Tongass.

HABITAT CAPABILITY MODEL FOR BLACK BEAR IN SOUTHEAST ALASKA

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of black bear (*Ursus americanus*). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. This model was developed to evaluate the potential quality of year-round habitats for black bear.

The original range of the black bear in North America corresponded with forested areas on the continent (Pelton 1982). However, the species has been extirpated from many midwestern and eastern states as a result of destruction and modification of habitat and over-exploitation of populations. Black bears now tend to be associated primarily with less settled, forested regions, including southeast Alaska. Black bears are highly adaptable and can tolerate moderate disturbances, such as habitat alteration, as long as the basic requirements for food and cover are satisfied (Lawrence 1979). Diversity of vegetative communities is the key to good bear range. Land management practices (e.g., timber harvest) may, therefore, enhance

Habitat for bears if their specific requirements are recognized and given consideration.

Habitat Use

Food

Although black bears have been characterized as omnivores they are primarily vegetarians that become carnivores only when prey or carrion is readily available. The dependance of black bears on vegetation as a food source has been demonstrated in that the distribution, availability, and phenology of key food plants are the primary factors affecting habitat selection and movements (Reynolds and Beecham 1980). Bears on a nutritionally superior diet generally mature earlier, have larger litters, and shorter breeding intervals (Rausch 1961, Jonkel and Cowan 1971, Rogers 1976, Reynolds and Beecham 1980). Although females normally breed only after separating from the cubs, some have been reported to breed while raising cubs in excellent habitat with abundant and diverse food supplies (LeCount 1980, Alt 1981).

The seasonal food habits of black bears in southeast Alaska may be predicted during years with adequate or abundant food. Black bears in this area normally leave their dens in April or May, depending on the severity of the winter (Erickson et al. 1982). Upon leaving their dens the bears seek out estuaries, beach fringes, and avalanche slopes where they eat the shoots and new leaves of emerging vegetation growth (Halter 1972, Modafferi 1982). From mid-June through mid-July the bears move to mid-elevations to feed on salmon berries (*Rubus spectabilis*) and deer cabbage (*Fauria crista-galli*) (Modafferi 1982). The bears will feed on spawning salmon (*Oncorhynchus* spp.) in mid-July to fall if streams supporting runs of fish are available. However, bears will leave a readily available salmon food source in late August and move to ripening salmonberries and blueberries (*Vaccinum* spp.) at higher elevations near alpine (McIlroy 1972, Modafferi 1982). This food resource is utilized until the bears return to their spring-summer range prior to denning in the fall. Similar patterns of resource utilization have been reported for black bears in other locations (Amstrup and Beecham 1976, Kellyhouse 1980, Pelton 1982).

Water

Black bears require free water (Towrey 1984). However, the amount required depends on the water content of the food they consume. Bears that consume large quantities of succulent plants and berries may not need large quantities of free water. Southeast Alaska is an area of high rainfall and numerous streams. Therefore, bears should not have any difficulty meeting their water needs.

Cover

The availability of cover is second only to food in determining the suitability of an area for black bears (Lindzey and Meslow 1977, Landers et al. 1979). Suitable cover may be characterized as old-growth forest stands with a well developed understory (Kemp 1979, Pelton 1982). Several studies have shown that although black bears prefer a diversity of vegetation communities, with early successional stages providing good foraging sites, they will not forage far from cover provided by mature to old-growth forest stands (Erickson 1965, McCollum 1973, Lawrence 1979, Barber 1983, Schwartz and Franzmann 1983).

When threatened in openings, black bears tend to seek protection in the nearest mature old-growth forest stand (Lindzey and Meslow 1977). Females with cubs are even more sensitive to the availability of cover. They have been reported to forage only in forested areas or forage not more than 330 ft (100 m) from forested cover (Herrero 1978,

Rogers 1977). During periods of inactivity (i.e., midday and midnight) bears also utilize old-growth forest habitat as bed sites (Pelton 1982, Barber 1983).

Cover is also critical for providing adequate sites for denning. The structural characteristics and specific location of black bear dens varies greatly among regions. Excavated and natural depressions under tree roots, stumps, and fallen logs are often used (Erickson 1964, Rogers 1970, Lindzey and Meslow 1976, Tietje and Ruff 1980). The use of caves, bases of hollow trees, and above ground tree cavities has also been reported (Jonkel and Cowan 1971, Hamilton and Marchinton 1980, Johnson and Pelton 1981). Site condition (e.g., soil characteristics), climate, and availability contribute to the selection of den sites by black bears. Bears may prefer to excavate dens in areas that have well drained, stable soils that are excavated easily (Tietje and Ruff 1980). When such dens are lined with nest materials and are well covered with snow they offer excellent conservation of energy for overwintering bears (Folk et al. 1972).

However, ground den sites do not adequately reduce energy loss in southeast Alaska because of high ground moisture, limited soil development, and variable snow cover (Erickson et al. 1982). The potential for flooding is also great in excavated dens, especially in areas of high rainfall (Johnson and Pelton 1981, Alt and Gruttadauria 1984). In areas where soil is not suitable for excavation, old-growth timber is required to provide den sites (Beecham et al. 1983). Large, hollow trees are the preferred sites for dens when excavation is not possible (Landers et al. 1979). Tree dens provide a significant energy savings over open ground dens (Johnson et al. 1978, MacLentz et al. 1983). Tree dens also aid in maintaining female bears in good condition, resulting in increased productivity (Johnson and Pelton 1981).

Bears also tend to locate dens in areas where a dense understory provides concealment (Poelker and Hartwell 1973, Johnson and Pelton 1981, Beecham et al. 1983, LeCount 1983). Trees with characteristics suitable for bear dens (e.g., large, hollow) and a well developed understory are a product of old-growth forest in southeast Alaska (Erickson et al. 1982). Several studies, in Alaska and elsewhere, have reported a preference for mature and old-growth forests and avoidance of regenerating forests in selection of den sites (Lindzey and Meslow 1976, Tietje and Ruff 1980, Modafferi 1982). Kemp (1979) reported that although dens are usually located in mature and old-growth forest stands they also may occur in successional forests where snags of sufficient size are maintained. However, it should be noted that once snags in clearcuts and second growth forests deteriorate, replacements will not be available until the

stand begins to assume old-growth characteristics (i.e., after 250 years).

Rates of den reuse from one year to the next tend to be low (e.g., 5 percent) throughout the range of the black bear (Tietje and Ruff 1980, Novick et al. 1981, Modafferi 1982, Beecham et al. 1983, LeCount 1983, Alt and Gruttadauria 1984). Low reuse of dens appears to be beneficial by reducing predation by other bears and gray wolves (Canis lupus) and disease transmission (Alt and Gruttadauria 1984). Bears are also better able to relocate quickly, if they are disturbed, to previous years' dens. Availability of suitable dens was not a limiting factor in any of these study areas. Lindzey and Meslow (1976) reported a high rate of reuse (i.e., 50 percent) in an area where suitable den sites were not abundant. It is, therefore, beneficial to a bear population to have large areas of quality denning habitat available (i.e., old-growth forest in southeast Alaska). Areas with abundant tree dens may also provide centers of dispersion for bear populations (Johnson and Pelton 1981).

Interspersion of Habitats

The movements of black bears are governed by the availability of food and cover with food being the most critical factor. Home ranges may also vary depending upon sex and age of individual bears, weather, and population densities (Pelton 1982). Since most of these factors are subject to changes beyond the influence of habitat quality, it is difficult to quantify the effect of dispersion of habitats on black bears. For example, black bears have been reported to move more than 100 mi (160 km) in response to changing availability of food resources (Rogers 1977).

However, it is important to have food resources available within close proximity to bears when they emerge from their dens in the spring. Their energy reserves are usually depleted at this time and it is critical that the bears not be required to forage extensively to find areas of new plant growth (e.g., grass flats on estuaries). Although black bears are not dependent upon migrating salmon as a food resource in most years, salmon can provide needed high protein if streams with significant runs are readily available to the bears.

Habitat Model

Movements and distribution of black bears are primarily influenced by the availability of food and cover. Food of the black bear in southeast Alaska consists primarily of new plant growth on open areas (e.g., estuaries, avalanche slopes) in the spring and fruits such as blueberries and salmon berries throughout the rest of the summer. Many of

the foods preferred by bears grow best in openings, such as avalanche slopes and clearcuts, so openings tend to enhance the value of forest habitat unless they are very large. Bears tend not to move very far from cover provided by mature and old-growth forests when they are foraging, so the centers of large openings without cover will not be utilized. The availability of migrating salmon to bears as a food source also affects the suitability of a site for black bears.

The availability of den sites is also a critical determinant of habitat quality for black bears. The characteristics of preferred sites in southeast Alaska (e.g., hollow logs and trees, dense shrub growth) are typically associated with old-growth forests.

The capability of old-growth, forested habitats to produce food in the form of succulent plants in the spring (e.g., skunk cabbage [Lysichitum americanum]) and berries in the summer and fall is directly related to the composition, structure, and productivity of vegetation on a site. The plant association (habitat type) serves as an indicator of these characteristics as does site index which is reflected by volume of timber. The attributes of specific plant associations and timber volume classes may be used to quantify their value as habitat for black bear. Forested plant associations have been described for portions of southeast Alaska (Martin et al. 1985) and timber volume has been assigned to timber stands throughout southeast Alaska. old-growth forests, 250+ years old, are characterized, in part, by abundant canopy openings and a well developed understory. Production of skunk cabbage in the spring and summer tends to be highest in the open canopied, poorly drained muskeg forests (Table 1). Berry production is high in open canopied, low and mid volume timber stands and in the subalpine zone through out the summer. Suitability index values assigned to these habitats reflect the importance of these habitats to black bears.

Harvesting forested stands by clearcutting in southeast Alaska results in predictable stages of plant community composition and structure and associated use by black bears (Alaback 1982a, 1982b). Biomass of shrubs that provide preferred foods for black bears (i.e., salmon berry and blueberry) increases dramatically within the first 10 years after a stand is clearcut, providing excellent foraging habitat (Alaback 1984). Bears avoid clearcuts until forage plants have become well established (i.e., after 2 to 3 years in southeast Alaska) (Jonkel and Cowan 1971, McCollum 1973, Kellyhouse 1980). Clearcuts 10 to 15 years old are preferred because of the production of large amounts of soft mast (Lindzey and Meslow 1977) (Table 1). The tree canopy begins to close in after 20 years on the most productive sites and decreases the amount of light that reaches the

forest floor (Alaback 1984). This results in a dramatic reduction of shrubs that produce food for bears in second growth stands. Production of soft mast is nearly eliminated by age 40 and black bears subsequently avoid these habitats until the canopy begins to open again at age 150 (Lindzey and Meslow 1977, Alaback 1984).

Black bears in Alaska utilize spawning salmon as a food source in late summer and fall when salmon are readily available (McIlroy 1972, Modafferi 1982). Riparian areas with salmon producing streams will therefore enhance the value of habitat for black bear over upland habitats during these times of the year (Table 2). The potential productivity of a stream for salmon may be classified by channel type (Marion et al. 1987; unpublished data, Ketchikan Area, Tongass National Forest) (Table 3). Channel types with the highest potential salmon production will enhance surrounding habitat for black bears.

Upon emergence from dens in the spring black bears seek sources of new plant growth as forage (Hatler 1972, Modafferi 1982). Grass flats on estuaries provide such food sources in southeast Alaska. Low elevation forests near the beach, with skunk cabbage and deer cabbage, also provide needed forage at this time of the year. Plant phenology is delayed at higher elevations, so beach fringe habitats provide high quality for black bears during this critical period (Table 4). Estuaries also provide high quality foraging habitat for bears in late summer and fall, prior to denning (Table 5).

Black bears tend to select den sites in stands with specific cover attributes (e.g., availability of hollow trees and logs, well developed shrub layer). These attributes are characteristics of highly productive, mature and old-growth forests in southeast Alaska and can be related to stand age (Alaback 1984) and timber volume. As a stand approaches 250+ years of age it begins to exhibit these characteristics and subsequently should be more preferred as a den site than younger stands. The Suitability Index values assigned to habitats available in southeast Alaska include consideration of den sites (Tables 1, 2, 4, and 5).

Habitat capability

The density of black bear on Prince of Wales Island in southern southeast Alaska has recently been estimated to be 1.5 bear/mi^2 (0.6 bear/km^2) (Alaska Department of Fish and Game, unpublished data). This is assumed to be the mean density on a typical forested landscape in southeast Alaska. This density was used to calibrate the model on a 136.6 mi^2 (35,380 ha) area in the interior of Prince of Wales Island. When optimum habitat (i.e., suitability index = 1.0) was assumed to support a population of 1.9 bear/mi^2

(0.7 bear/km^2) the model projected an overall density of 1.49 bear/mi^2 (0.58 bear/km^2). This closely approximates the estimated density of the area. Density of black bear in optimum habitats is therefore assumed to be 1.9 bear/mi^2 (0.7 bear/km^2) (Tables 1,2, and 4).

Disturbance and Human-induced Mortality

Although black bears can adapt to changes in their environment induced by humans, associated increases in human-related mortality (other than legal hunting mortality) often reduces total density of black bears (Hugie 1979, Lentz et al. 1980, Pelton 1982). The effects of several

activities that may result the displacement or mortality (through poaching and defense of life and property) of black bears were evaluated (Table 6). Coefficients were established for each listed activity to provide an index to the effect of these activities on populations of black bears. The potential capability of habitats to support black bears in the vicinity of these activities is reduced by multiplying the density of black bears calculated from the habitat model by the appropriate coefficient.

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on populations of black bear. This will be done to ensure the model results approximate the results of field studies.

The location of stands coded as grassland in the timber inventory portion of the GIS should be evaluated and their importance and habitat for black bears determined. It should also be determined what is considered an estuary in the GIS database to verify that their importance as habitat for black bears is adequately represented.

Once these aspects of verification are completed, reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Suitability of upland habitats for black bear by season in southeast Alaska.

	Suitability Index by Season[a]					Annual Value[b]		
Habitat	Spring	Early Summer	Late Summer	Fall	Denning[c]	Cumulative	Index	/mi²
old-growth								
20,000+ board feet/acre	0.5	0.5	0.4	0.4	1.5	3.3	0.7	1.3
8-20,000 board feet/acre	0.6	0.7	0.7	0.7	0.5	3.2	0.7	1.3
Muskeg forest	0.7	0.7	0.4	0.4	0.0	2.2	0.5	1.0
Subalpine zone	0.0	0.8	0.6	0.7	0.0	2.8	0.6	1.1
Second growth (> 25 yrs)	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Clearcut (0-25 yrs)	0.6	0.5	0.7	0.7	0.6	3.1	0.6	1.1
Nonforest								
Avalanche slopes	1.0	1.0	0.5	1.0	0.0	3.5	0.7	1.3
Muskeg	0.0	0.1	0.1	0.1	0.0	0.3	0.1	0.2
Alpine	0.0	0.7	0.3	0.1	0.0	1.1	0.2	0.4

[a]Spring - from den exit to 15 June; black bear's diet consists mainly of grasses and early greening forbs.

Early summer - from 15 June to 15 July; black bear's diet consists mainly of forbs and berries.

Late summer - from 15 July to 15 September; black bear's diet consists mainly of fish, berries and forbs.

Fall - from 15 September to den entrance; black bear's diet is dominated by berries, forbs, and fish.

Denning - from den entrance to early spring; black bear are dependant on sites suitable for denning.

[b]The cumulative value is the sum of the seasonal values. The index was calculated by scaling the cumulative values from 0 to 1 (i.e., all cumulative values were divided by the highest value - 4.8).

[c]Denning values for each habitat were weighted by 1.5 to reflect the importance of denning habitat in the model.

Table 2. Suitability of riparian habitats for black bear by season and potential salmon production in southeast Alaska.

Habitat	Suitability Index by Season[a]					Annual Value[b]		
Fish Production	Spring	Early Summer	Late Summer	Fall	Denning[c]	Cumulative	Index/mi^2	
old-growth								
20,000+ board feet/acre								
High fish production[d]	0.5	0.5	0.7	0.7	1.5	3.9	0.8	1.5
Medium fish production[d]	0.5	0.5	0.5	0.5	1.5	3.5	0.7	1.3
Low fish production[d]	0.5	0.5	0.3	0.3	1.5	3.1	0.6	1.1
8-20,000 board feet/acre								
High fish production	0.6	0.7	0.9	0.9	0.5	3.6	0.8	1.5
Medium fish production	0.6	0.7	0.6	0.6	0.5	3.0	0.6	1.1
Low fish production	0.6	0.7	0.5	0.5	0.5	2.8	0.6	1.1
Muskeg forest								
High fish production	0.7	0.7	0.9	0.9	0.0	3.2	0.7	1.3
Medium fish production	0.7	0.7	0.6	0.6	0.0	2.6	0.5	1.0
Low fish production	0.7	0.7	0.5	0.5	0.0	2.4	0.5	1.0
Subalpine zone								
High fish production	0.0	0.8	0.8	0.9	0.6	3.1	0.6	1.1

Table 2 cont. Suitability of riparian habitats for black bear by season and potential salmon production in southeast Alaska.

Habitat Fish Production	Suitability Index by Season[a]					Annual Value[b]		
	Spring	Early Summer	Late Summer	Fall	Denning[c]	Cumulative	Index/mi^2	
Medium fish production	0.0	0.8	0.6	0.6	0.6	2.6	0.5	1.0
Low fish production	0.0	0.8	0.4	0.5	0.6	2.3	0.5	1.0
Cottonwood								
High fish production	0.5	0.5	0.7	0.7	1.5	3.9	0.8	1.5
Medium fish production	0.5	0.5	0.5	0.5	1.5	3.5	0.7	1.3
Low fish production	0.5	0.5	0.3	0.3	1.5	3.1	0.6	1.1
Second growth								
High fish production	0.0	0.0	0.5	0.5	0.2	1.2	0.3	0.6
Medium fish production	0.0	0.0	0.3	0.3	0.2	0.8	0.2	0.4
Low fish production	0.0	0.0	0.1	0.1	0.2	0.4	0.1	0.2
Clearcut								
High fish production	0.6	0.5	0.9	0.9	0.6	3.5	0.7	1.3
Medium fish production	0.6	0.5	0.6	0.6	0.6	2.9	0.6	1.1
Low fish production	0.6	0.5	0.5	0.5	0.6	2.7	0.6	1.1

Table 2 cont. Suitability of riparian habitats for black bear by season and potential salmon production in southeast Alaska.

	Suitability Index by Season[a]					Annual Value[b]		
Habitat Fish Production	Spring	Early Summer	Late Summer	Fall	Denning[c]	Cumulative	Index	/mi^2
Nonforest								
Avalanche slopes								
High fish production	1.0	1.0	0.8	1.0	0.0	3.8	0.8	1.5
Medium fish production	1.0	1.0	0.5	0.8	0.0	3.3	0.7	1.3
Low fish production	1.0	1.0	0.4	0.6	0.0	3.0	0.6	1.1
Muskeg								
High fish production	0.0	0.1	0.6	0.6	0.0	1.3	0.3	0.6
Medium fish production	0.0	0.1	0.3	0.3	0.0	0.7	0.2	0.4
Low fish production	0.0	0.1	0.2	0.2	0.0	0.5	0.1	0.2
Grassland								
High fish production	1.0	1.0	0.6	0.6	0.0	3.2	0.7	1.3
Medium fish production	1.0	1.0	0.3	0.3	0.0	2.6	0.5	1.0
Low fish production	1.0	1.0	0.2	0.2	0.0	2.4	0.5	1.0

Table 2 cont. Suitability of riparian habitats for black bear by season and potential salmon production in southeast Alaska.

Habitat Fish Production	Suitability Index by Season[a]					Annual Value[b]		
	Spring	Early Summer	Late Summer	Fall	Denning[c]	Cumulative	Index/mi^2	
Other								
High fish production	0.0	0.1	0.6	0.6	0.0	1.3	0.3	0.6
Medium fish production	0.0	0.1	0.3	0.3	0.0	0.7	0.1	0.2
Low fish production	0.0	0.1	0.2	0.2	0.0	0.5	0.1	0.2

[a]Spring - from den exit to 15 June; black bear's diet consists mainly of grasses and early greening forbs.

Early summer - from 15 June to 15 July; black bear's diet consists mainly of forbs and berries.

Late summer - from 15 July to 15 September; black bear's diet consists mainly of fish, berries and forbs.

Fall - from 15 September to den entrance; black bear's diet is dominated by berries, forbs, and fish.

Denning - from den entrance to early spring; black bear are dependant on sites suitable for denning.

[b]The cumulative value is the sum of the seasonal values. The index was calculated by scaling the cumulative values from 0 to 1 (i.e., all cumulative values were divided by the highest value - 4.8).

[c]Denning values for each habitat were weighted by 1.5 to reflect the importance of denning habitat in the model.

[d]Values for the production of anadromous fish have been assigned to streams and rivers in southeast Alaska on the basis of channel type (Marion et al. 1987; USDA Forest Service, Ketchikan Area, unpublished information) (Table 3).

Table 3. Potential production[a] of pink salmon (Oncorhynchus gorbuscha) and coho salmon (O. kisutch) by channel type[b] in southeast Alaska.

Production Group Channel Type	Adult Pink Salmon/ft	Adult Coho Salmon/ft
High fish production		
Shallowly incised, low gradient, lowland channel (B1)	2.27	0.0072
Shallowly incised, low gradient, floodplain channel (C1)	4.03	0.0150
...............................(C1/B3)	1.82	0.0050
Shallow to moderately incised, low gradient, lowland channel (C2)	2.06	0.0104
Shallowly incised, low gradient, floodplain channel (C3)	8.58	0.0170
Shallowly incised, low gradient, high energy, floodplain channel (C3.1)	2.21	0.0078
Moderate to deeply incised, low gradient, lowland channel (C5)	1.09	0.0068
Shallowly incised, low gradient, deep water channel, lowland channel (L3)	3.34	0.0120
Low gradient, estuarine channel (E1)	9.19	0.0106
Low gradient, rocky, estuarine channel (E2)	2.91	0.0066
Average production	3.75	0.0098
Medium fish production		
Non-incised, high gradient, alluvial/colluvial fan channel (A3)	0.52	0.0016
Shallowly incised, moderate gradient, footslope channel (B2/B3)	0.91	0.0046
Shallowly incised, moderate gradient, transitional footslope channel (B4)	0.49	0.0026
Shallowly incised, low gradient, adfluvial fan channel (B5)	0.90	0.0022
Moderately incised, moderate gradient, transitional footslope channel (B6)	0.53	0.0036
Deeply incised, moderate gradient, transitional channel (B7)	0.41	0.0046
Average production	0.63	0.0032

Table 3. (Continued) Potential production[a] of pink salmon (*Oncorhynchus gorbuscha*) and coho salmon (*O. kisutch*) by channel type[b] in southeast Alaska.

Production Group Channel Type	Adult Pink Salmon/ft	Adult Coho Salmon/ft
Low fish production		
Very deeply incised, high gradient, mountain slope channel (A1)	0.13	0.0014
Deeply incised, high gradient, mountain slope channel (A2)	0.19	0.0020
Shallowly incised, very high gradient, mountain slope channel (A4)	0.15	0.0010
Deeply incised, high gradient, mountain slope channel (A5)	0.15	0.0018
Shallowly incised, high gradient, transitional channel (A6)	0.06	0.0016
Low gradient, glacial sloping, lowland cahnnel (D1)	0.00	0.0030
Low gradient, nonforested, lowland channel (L1)	0.07	0.0042
Average production	0.11	0.0021

[a]Fishery production values are from USDA Forest Service, Tongass National Forest, Ketchikan Area, unpublished information.

[b]Channel types are from Marion et al. (1987).

Table 4. Suitability of beach fringe[a] habitats for black bear by season in southeast Alaska.

Habitat	Spring	Early Summer	Late Summer	Fall	Denning[d]	Cumulative	Annual Value[c] Index	Annual Value[c] #/mi^2
	Suitability Index by Season[b]							
old-growth								
20,000+ board feet/acre	0.8	0.6	0.5	0.4	1.5	3.8	0.8	1.9
8-20,000 board feet/acre	0.8	0.7	0.6	0.5	0.5	3.1	0.6	1.7
Muskeg forest	0.9	0.7	0.6	0.5	0.0	2.7	0.6	1.1
Second growth	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Clearcut	0.8	0.6	0.6	0.5	0.5	3.0	0.6	1.1
Nonforest								
Avalanche slopes	1.0	0.8	0.5	1.0	0.0	3.3	0.7	1.3
Muskeg	0.0	0.1	0.1	0.1	0.0	0.3	0.1	0.2

[a]Beach fringe is defined as all areas within 500 ft (150 m) of mean high tide.

[b]Spring - from den exit to 15 June; black bear's diet consists mainly of grasses and early greening forbs.

Early summer - from 15 June to 15 July; black bear's diet consists mainly of forbs and berries.

Late summer - from 15 July to 15 September; black bear's diet consists mainly of fish, berries and forbs.

Fall - from 15 September to den entrance; black bear's diet is dominated by berries, forbs, and fish.

Denning - from den entrance to early spring; black bear are dependant on sites suitable for denning.

[c]The cumulative value is the sum of the seasonal values. The index was calculated by scaling the cumulative values from 0 to 1 (i.e., all cumulative values were divided by the highest value - 4.8).

[d]Denning values for each habitat were weighted by 1.5 to reflect the importance of denning habitat in the model.

Table 5. Suitability of estuary fringe[a] habitats for black bear by season in southeast Alaska.

Habitat	Suitability Index by Season[b]					Annual Value[c]		
	Spring	Early Summer	Late Summer	Fall	Denning[d]	Cumulative	Index	#/mi^2
old-growth								
20,000+ board feet/acre	0.9	0.7	0.9	0.8	1.5	4.8	1.0	1.9
8-20,000 board feet/acre	0.9	0.6	1.0	0.9	0.5	3.9	0.8	1.5
Muskeg forest	1.0	0.6	1.0	0.9	0.0	3.5	0.7	1.3
Second growth	0.1	0.1	0.1	0.1	0.2	0.6	0.1	0.2
Clearcut	0.8	0.6	0.6	0.5	0.5	3.0	0.6	1.1
Nonforest								
Avalanche slopes	1.0	0.8	0.5	1.0	0.0	3.3	0.7	1.3
Muskeg	0.0	0.1	0.1	0.1	0.0	0.3	0.1	0.2

[a] Estuary fringe is defined as all areas within 1000 ft (300 m) of mean high tide, adjacent to estuaries.

[b] Spring - from den exit to 15 June; black bear's diet consists mainly of grasses and early greening forbs.

Early summer - from 15 June to 15 July; black bear's diet consists mainly of forbs and berries.

Late summer - from 15 July to 15 September; black bear's diet consists mainly of fish, berries and forbs.

Fall - from 15 September to den entrance; black bear's diet is dominated by berries, forbs, and fish.

Denning - from den entrance to early spring; black bear are dependant on sites suitable for denning.

[c]The cumulative value is the sum of the seasonal values. The index was calculated by scaling the cumulative values from 0 to 1 (i.e., all cumulative values were divided by the highest value - 4.8).

[d]Denning values for each habitat were weighted by 1.5 to reflect the importance of denning habitat in the model.

Table 6. Effects of disturbance on the habitat capability for black bearsin southeast Alaska.

Activity/landscape Modification	Reduction Factor
Open-pit garbage dump	
(< 1 mi radius)	0.1
(1-5 mi radius)	0.5
FS cabin/developed campground/seasonal camp	
(≤ 1 mi radius)	0.9
Permanent camp site/ residence/float camp	
(< 1 mi radius)	0.6
(1-5 mi radius)	0.9
Access point (airstrip, dock, lake/float plane)	
(≤ 1 mi radius)	0.9
Road accessible to vehicles	
(≤ 2 mi radius)	0.8
Transportation link (ferry access/town)	
(≤ 2 mi radius)	0.8
Accessible road within 0.5 mi of anadromous fish stream	
(≤ 0.5 mi radius)	0.8
Trails or road access limited to hiking	
(≤ 2 mi radius)	0.9
Road limited to hiking/ ORV (≤ 0.5 mi of anadromous fish stream)	
(≤ 1 mi radius)	0.9

HABITAT CAPABILITY MODEL FOR GRAY WOLVES IN SOUTHEAST ALASKA

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of gray wolf (Canis lupus). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is applicable throughout southeast Alaska.

The original distribution of gray wolves included all of North America except for the southeast United States, extreme southwest California, and western Mexico (Paradiso and Nowak 1982). The gray wolf has been eliminated throughout most of the lower 48 United States as a result of predator control programs and loss of habitat. Remnant populations remain in northern Minnesota and a small portion of northwest Montana. Gray wolves continue to occur throughout Alaska. Their populations in Alaska have been characterized as stable to increasing (Townsend 1986). The distribution of gray wolves in southeast Alaska generally includes all areas except Admiralty, Baranof, and Chichagof Islands. Gray wolves were subjected to indiscriminate killing and bounties throughout Alaska during the early 1900's (Harbo and Dean 1983). A federal wolf control program with emphasis on poisoning and aerial hunting began in the 1940's. This program continued in southeast Alaska until statehood was achieved in 1959.

Habitat Use

Gray wolves do not exhibit a preference for specific habitats or habitat characteristics (Paradiso and Nowak 1982). Their original distribution included arctic tundra; taiga; plains or steppes; savannahs; and hardwood, softwood, and mixed forests. The presence and well being of gray wolves appears to be dependant on the availability of prey rather than land form, climate, or vegetation.

A review of the population dynamics of gray wolves demonstrated that rates of increase are primarily determined by the availability of ungulate prey (Keith 1983). Potvin (1988) determined that the population of wolves he studied in Quebec was regulated largely by social factors and not by food stress. Packard and Mech (1980) concluded that intrinsic social factors and the influence of food supply are interrelated in determining population levels of gray

wolves. It has been demonstrated that predation by gray wolves sustains declines in ungulate populations that have been initiated by the other factors (e.g., severe weather, habitat change) (Mech and Karns 1977, Nelson and Mech 1981, Gasaway et al. 1983, Van Ballenberghe and Hanley 1984, Smith et al. 1986a). As prey populations decline the well-being of gray wolf populations is depressed and their populations also decline (Van Ballenberghe and Mech 1975, Messier 1985, 1987).

The gray wolf has adapted to a carnivorous diet that is made up mainly of large ungulates or beaver (Castor canadensis) (Paradiso and Nowak 1982). Prey must be taken frequently by gray wolves. This prey includes includes deer (Odocoileus spp.), moose (Alces alces), caribou (Rangifer tarandus), Dall sheep (Ovis dalli), bighorn sheep (Ovis canadensis), and beaver (Murie 1944, Cowan 1947, Tompson 1952, Mech 1966, Pimlott et al. 1969, Van Ballenberghe et al. 1979, Nelson and Mech 1981, Fritts and Mech 1981, Gasaway et al. 1983, Peterson et al. 1984). Prey available to gray wolves in southeast Alaska inclue Sitka black-tailed deer (Odocoileus hemionus sitkensis), moose, mountain goat (Oreamnus americanus), beaver, and spawning salmon (Oncorhynchus spp.) (LaResche et al. 1974, Fox and Streveler 1986, Smith et al. 1986b)

Habitat Capability

The habitat capability model for gray wolves is tied directly to habitat capability models for Sitka black-tailed deer, moose, and mountain goat (Suring et al. 1988a, 1988b). The assumption is made in this model that gray wolves will first select large ungulates as prey and utilize beaver as maintenance prey when ungulates are not plentiful (Mech 1970).

As a minimum, 3.7 lbs (1.7 kg)/day of prey are required to maintain a gray wolf (Mech 1970). The normal amount of prey consumed by gray wolves ranges from 5.5 lbs (2.5 kg) to 13.9 lbs (6.3 kg)/day (Mech 1974). The median figure of 9.7 lbs (4.4 kg)/day is the amount of prey assumed to be required by a gray wolf in this model.

The mean weight of 45 adult Sitka black-tailed deer collected in southeast Alaska was 93 lbs (42.2 kg) (Johnson 1987). The mean weight of 7 fawns was 42 lbs (19.3 kg) in the same study. Approximately 50 percent of deer killed by gray wolves are fawns (Pimlott 1967, Fritts and Mech 1981). Therefore, the average weight of adult and fawn deer killed by gray wolves in southeast Alaska is assumed to be 68 lbs (31 kg).

The mean weight of 17 adult Alaska female moose was approximately 990 lbs (450 kg) (Franzmann et al. 1978). The

average weight of Alaska calves in October was approximately 400 lbs (180 kg); by 16-18 months of age moose approach a mean weight of 615 lbs (280 kg) (Franzmann et al. 1978). Reported proportions of calves in wolf-killed moose range from 34 percent to 56 percent (Peterson 1977, Peterson et al. 1984). Wolf predation decreases significantly for moose from ages 1 to 5, then increases again after 6 years. The assumption is made in this model that 50 percent of moose killed by gray wolves are calves and 50 percent are older adults. Therefore, the average moose killed is assumed to weigh approximately 700 lbs (320 kg).

The approximate mean weight of adult mountain goats was reported as 140 lbs (65 kg) (Rideout 1974). However, the larger males are probably not preyed upon as extensively as smaller mountain goats so the average weight of mountain goats is assumed to be 110 lbs (50 kg) for the purposes of this model.

The weights used by Peterson (1977) for edible portions of a carcass suggest that approximately 75 percent of a carcass is available to gray wolves as food. The remaining 25 percent consists of inedible stomach and intestinal contents and portions of the hide and skeleton that are usually left uneaten. The assumption is made in this model that gray wolves consume 75 percent of the body weight of prey captured.

Numerous studies have shown that the vulnerability of individual prey species varies. Gray wolves tend to take younger and older animals and those individuals that are injured or sick (Mech 1970, Peterson et al. 1984). Mech (1977) has also shown that potential prey living in the buffer zones between gray wolf pack territories are less vulnerable to predation than individuals within the territories. Buffer zones constitute from 25 percent to 40 percent of an area. These findings imply that all individuals within a prey population are not equally available to gray wolves as prey. It has also been generally concluded that gray wolves do not completely deplete their prey populations (Murie 1944, Stenlund 1955, Pimlott et al. 1969, Mech 1970, Kolenosky 1972).

Data presented in Nelson and Mech (1981) indicate that the annual mortality of deer as a result of predation by gray wolves was approximately 15 percent for fawns and 18 percent for adults in northeastern Minnesota. The winter habitat capability model for Sitka black-tailed deer developed for southeast Alaska assumed a 10 percent to 30 percent predation rate of gray wolves on deer depending on snow depth (Suring et al. 1988a). The assumption is made in this model that 20 percent of the potential annual deer population is available, as prey, to gray wolves.

The percentage of moose populations reported killed by gray wolves in Alberta and interior Alaska ranged from 10 percent to nearly 30 percent (Fuller and Keith 1980, Gasaway et al. 1983). However, deer are the preferred prey of gray wolves when deer are available (Pimlott et al. 1969, Mech and Frenzel 1971, Potvin, Jolicoeur, and Huot 1988). Considering this aspect and the limited distribution of moose in southeast Alaska it is assumed in this model that 5 percent of the potential annual moose population is available as prey to gray wolves.

The habitats preferred by mountain goats (i.e., associated with cliffs) are effectively used to avoid predation by gray wolves (Smith et al. 1986b). The annual rate of predation on mountain goats by gray wolves is assumed to be 5 percent in this model.

Harvests of these prey populations (i.e., Sitka black-tailed deer, moose, and mountain goat) by humans may also decrease the amount of prey available to gray wolves. However, the assumption is made in this model that predation by gray wolves takes place before hunting mortality occurs.

Densities of 0.1 adult gray wolves/mi^2 (0.04/km^2) are considered high (Paradiso and Nowak 1982). This density has been generally accepted as the saturation point beyond which gray wolf populations would not expand (Pimlott 1967, Mech 1970). Instances have been reported in which gray wolf populations have exceeded this density (Kuyt 1972, Van Ballenberghe 1974). Mech (1974) concluded that average gray wolf densities very rarely exceed 0.1/mi^2 (0.04/km^2) but that densities may almost double during periods of exceptionally high prey concentrations. Maximum density of adult gray wolves in this model will not exceed 0.1/mi^2 (0.04/km^2).

As ungulate prey populations decline due to habitat changes or severe winters, gray wolf populations will exhibit a similar decline (Van Ballenberghe et al. 1975, Van Ballengerghe and Mech 1975). It is assumed that beaver provide a subsistence prey source in southeast Alaska upon which gray wolves can rely when ungulate populations are at low levels. Such a situation currently exists on the northeast portion of Revillagigedo Island in southern southeast Alaska (Smith et al. 1986b). Late winter population density of gray wolves in this area was estimated to be 0.01/mi^2 (0.004/km^2). This is assumed to be the minimum density of gray wolves in this model.

Equations

Sitka black-tailed deer--The equation that estimates the annual prey base provided to gray wolves by the Sitka black-tailed deer population is:

$$\text{\# of wolves supported by deer} = \frac{[(\text{\# deer/mi}^2 \times .2) \times 68 \text{ lbs/deer}] \times .75}{\dfrac{9.7 \text{ lbs/wolf/day}}{365 \text{ days/year}}}$$

Where 0.2 = maximum proportion of prey population available to gray wolves.

0.75 = proportion of carcass that is edible.

<u>Moose</u>--The equation that estimates the annual prey base provided to gray wolves by the moose population is:

$$\text{\# of wolves supported by moose} = \frac{[(\text{\# moose/mi}^2 \times .05) \times 700 \text{ lbs/moose}] \times .75}{\dfrac{9.7 \text{ lbs/wolf/day}}{365 \text{ days/year}}}$$

Where 0.05 = maximum proportion of prey population available to gray wolves.

0.75 = proportion of carcass that is edible.

<u>Mountain goat</u>--The equation that estimates the annual prey base provided to gray wolves by the mountain goat population is:

$$\text{\# of wolves supported by mountain goats} = \frac{[(\text{\# goats/mi}^2 \times .05) \times 110 \text{ lbs/goat}] \times .75}{\dfrac{9.7 \text{ lbs/wolf/day}}{365 \text{ days/year}}}$$

Where 0.05 = maximum proportion of prey population available to gray wolves.

0.75 = proportion of carcass that is edible.

<u>Gray wolves</u>--The equation that estimates the potential population of gray wolves is:

gray wolves/mi^2 = # of deer supported by wolves + # of deer supported

by moose + # of deer supported by mountain goats

$$0.01/\text{mi}^2 \leq \text{\# gray wolves/mi}^2 \leq 0.1/\text{mi}^2$$

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on populations of gray wolves. This will be done to ensure the model results approximate the results of independent field studies.

The minimum and maximum densities of gray wolves (i.e., 0.01/mi^2 [0.004/km^2] and 0.1/mi^2 [0.04/km^2] respectively) require verification to determine if these values overly restrict operation of the model. It should also be determined during verification exercises if there a difference in model results when the maximum proportion of the prey population available is calculated on a stand by stand basis as compared to a Minor Harvest Unit basis. The differences, if any, in these approaches should be documented and a preferred method recommended. Interactions between the habitat capability models for the prey species and this model should be evaluated to ensure that realistic results are obtained.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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HABITAT CAPABILITY MODEL FOR RED SQUIRRELS IN SOUTHEAST ALASKA

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of red squirrels (*Tamiasciurus hudsonicus*). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Year-round habitat of the red squirrel is evaluated in the model.

Red squirrels are associated with boreal forests from Alaska across North America and south into the coniferous forests of the Rocky Mountains (Flyger and Gates 1982). In the east they occur across the Great Lake States to the Atlantic Ocean. Red squirrels occur naturally on the mainland throughout Southeast Alaska. In 1930 and 1931 they were introduced to Baranof and Chichagof islands as a potential prey species for recently introduced marten (*Martes americana*) (Burris and McKnight 1973). Red squirrels are currently abundant on Baranof, Chichagof, Kruzof, and adjacent islands as well as mainland areas (Johnson 1981).

Habitat Use

Food items normally eaten by red squirrels include seeds, fleshy fruits, green plant matter, fungus, flesh, and insects (Klugh 1927, Hatt 1929, Layne 1954, Ferron et al. 1986). However, red squirrels are so strongly associated with conifer forests that their population densities (e.g. productivity, survival, and dispersal) fluctuate with cone crops (Smith 1968, Gurnell 1983, Halvorson and Engeman 1983). During periods of cone abundance red squirrels will annually cut and cache from 12,000 to 16,000 cones for later use. Red squirrels were able to survive the first of 2 consecutive years of cone failure in a mature white spruce

(*Picea glauca*) forest in interior Alaska by feeding on cached cones (Smith 1968). However, a 67 percent drop in numbers of the red squirrel population followed the second crop failure. The remaining red squirrels survived by utilizing spruce buds as their primary food during the winter. During late spring mushrooms became the most important food item in their diet. Spruce cones, spruce buds, and mushrooms made up over 90 percent of the red squirrels diet during this study.

Red squirrels have adapted to utilize conifer seeds and fungi in boreal conifer forests (Smith 1970). Therefore, their habitat can be broadly defined as conifer forest throughout their range. Red squirrels establish and hold territories within these habitats (Smith 1968 and 1981, Kemp and Keith 1970, Rusch and Reeder 1978). Individual red squirrels of both sexes defend territories ranging from 0.5 to 7.5 acres (0.2 to 3.0 ha) that are centered on caches of cones (Hatt 1943, Finley 1969, Smith 1981, Gurnell 1984, Lair 1987) and nest sites (Vahle 1978, Rothwell 1979).

Since red squirrels are so strongly dependant upon conifer seeds as a food supply, conifer forests must be of seed producing age before red squirrels will make significant use of them. Habitat quality is also related to nesting cover and food caching sites. Natural cavities are preferred by red squirrels as nest sites (Hamilton 1939, Layne 1954). However, underground nests and external tree nests are more commonly used where cavities are not available (Fancy 1980). Such nests are constructed primarily of grass or moss with an inner compartment of shredded bark, leaves, feathers, and fur.

Tree diameter and branching structure appear to be the most important factors influencing nest-tree selection (Fancy 1980). Mean diameter at breast height (dbh) of white spruce with nests present was significantly greater than mean dbh of randomly selected white spruce trees near Atlin, British Columbia. Nests also tended to be located in trees, or portions of trees, with the most dense branches. Another important feature associated with nest trees on the Atlin site and also reported by Rothwell (1979) in Wyoming and Vahle and Patton (1983) in Arizona is interlocking crowns with adjacent trees. The close proximity of the nest tree to surrounding trees offers protection from weather, provides multiple escape routes, and reduces foraging time.

Habitat selection in red squirrels is also related to food cache sites. Large diameter trees, large standing snags, and fallen trees are important sites for cone storage (Vahle and Patton 1983). The frequent association of caches with large-diameter trees, logs, and snags indicates that red squirrels prefer these sites for use as feeding stations and caches. The crevices under downed logs and cavities in snags provide protection for stored cones.

Habitat Model

Optimum habitat for red squirrels provides opportunities for obtaining food, food caching sites, and nesting cover (Vahle and Patton 1983). This includes forested stands with 2 or more species of conifers of cone-bearing age for food, snags for den sites, and down logs to serve as nuclei for food

caches. These conditions are best provided in old-growth Sitka spruce (Picea sitchensis) forests in southeast Alaska which is assumed to provide optimum habitat (Table 1). Middens are consistently associated with large Sitka spruce trees in southeast Alaska and density of middens is higher in Sitka spruce stands than in other forest types (Alaska Dep. Fish and Game, unpublished data). Although western hemlock (Tsuga heterophylla), western red cedar (Thuja plicata), and Alaska cedar (Chamaecyparis nootatensis) forest types provide the life requirements of red squirrels, food resources are not as plentiful as in forest types with a high Sitka spruce component.

Tree densities are low in muskeg forests and trees tend to be situated in stringers or small groups. Red squirrel nests are rarely located in isolated trees or clumps of trees indicating limited preference for this type of forest (Rothwell 1979). Although red squirrels are found in pure hardwood stands their preferred habitat is conifer forest so the suitability index for deciduous stands is low (Flyger and Gates 1982).

Populations of red squirrels have been shown to decline significantly following clearcutting (Wolff and Zasada 1975; Medin 1986). However, use of clearcuts by red squirrels is not entirely precluded (Krull 1970). Fisch and Dimock (1978) reported squirrel use of 6 to 12 year old clearcuts in western Oregon and Washington where the squirrels were feeding by clipping buds and new shoots of regenerating conifers. Red squirrel populations in 20 year-old stands exhibited characteristics associated with suboptimal habitats (e.g., low proportion of breeding females, low survival rates) (Sullivan and Moses 1986). Therefore, the suitability of clearcuts approximately 0 to 25 years of age is low (Table 1).

Cone production (i.e., food production) may not begin until age 40 in Sitka spruce (Ruth 1958) which diminishes the value of pole stands as habitats for red squirrels (Table 1). Heavy cone and seed production has been reported in 100 year-old stands of western hemlock and Sitka spruce indicating valuable habitat for red squirrels (Ruth and Berntsen 1955). However, cavities are not available as den sites.

Habitat Capability

The highest reported densities for red squirrels exceed 3600 squirrels/mi^2 (230/km^2) in white spruce forests (Flyger and Gates 1982). However, densities of red squirrels are not thought to be that high in southeast Alaska (Alaska Dep. Fish and Game, unpublished data). Optimum habitat (i.e., suitability index = 1.0) in southeast Alaska is assumed to support 1280 squirrels/mi^2 (80/km^2) (Table 1).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on red squirrels. This will be done to ensure the model results approximate the results of independent field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Capability of habitats to support red squirrels in southeast Alaska.

Habitat	Suitability Index	Number per Square Mile
Old-growth forest		
Sitka spruce	1.0	1280
Western hemlock/ Sitka spruce	0.6	770
Western hemlock	0.4	510
Cedar	0.4	510
Muskeg (noncommercial)	0.3	380
Subalpine	0.2	260
Black cottonwood	0.2	260
Clearcut	0.1	130
Pole timber	0.3	380
Young growth sawtimber	0.8	1020
Other	0.0	0

Vancouver Canada Goose: Vancouver Canada geese, a resident year-round waterfowl species, use wetlands (both forested and non-forested) in the estuary, riparian, and upland areas of the forest. The public has shown interest in this species which is used for subsistence. Its populations are perceived as being affected by Forest management activities.

HABITAT CAPABILITY MODEL FOR BALD EAGLES IN SOUTHEAST ALASKA: NESTING HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of nesting bald eagles (*Haliaeetus leucocephalus*). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Only the nesting habitat of bald eagles is evaluated through this model. Limited information is available on the winter habitats and movements of bald eagles in southeast Alaska so this aspect is not considered. Excerpts from the publication on the status and biology of bald eagle populations in southeast Alaska by Sidle et al. (1986) are used extensively throughout this paper.

Habitat Use Information

Coastal Habitats

The majority of bald eagles in southeast Alaska nest in coniferous forest habitats along the coastline and associated saltwater inlets of southeast Alaska. Bald eagles prefer to nest adjacent to the coast, where they forage for fish, waterbirds, marine invertebrates, and drifting carrion (Kalmbach et al. 1964; Ofelt 1975). Of 3,850 nests surveyed by Hodges and Robards (1982), 92 percent occurred within 300 ft (90 m) of the shoreline. The average distance from nest to shoreline was 120 ft (37 m). Not all types of shoreline appeared equally acceptable to nesting bald eagles. The majority of nests examined (55 percent) were located along inland seas or broad channels. Nesting along saltwater bays was also common (31 percent). Brackish lagoons,

open seas, and narrow saltwater channels without tidal currents were used less frequently. Nests commonly occurred on prominent points of land, small islands, narrow passages with tidal currents, and shorelines exposed to large bodies of water, especially those facing into prevailing winds. These situations may provide the best opportunities for foraging over open water and on tidal flats.

Almost all nesting along the coast in southeast Alaska occurs in old-growth stands located within a well-forested

landscape. Survey results indicate that disturbed areas (e.g., clearcuts) without sufficient numbers of remnant old-growth trees are avoided by bald eagles (Hodges et al. 1984). Sitka spruce (Picea sitchensis) comprised 78 percent of 3,850 nest sites evaluated by Hodges and Robards (1982). Sitka spruce trees are usually taller and have a stronger top and branches than western hemlock (Tsuga heterophylla), which comprised 20 percent of the nest sites. Western redcedar (Thuja plicata) was used in only 2 percent of the nests observed. Large, old trees are most commonly selected by bald eagles for nesting. Nest trees examined by Hodges and Robards (1982) averaged 97 ft (30 m) in height and 3.6 ft (1.1 m) in diameter. These measurements suggest that typical nest trees are at least 400 to 500 years old.

Nests observed during the annual productivity surveys in the Seymour Canal Eagle Management Area suggest that the number of new nests built each year approximates the number lost each year (Hodges 1982). Annual rate of nest loss in Seymour Canal is about 5 percent, which implies an average nest life of 20 years. Assuming this area is typical of southeast Alaska, about 50 percent of the original nests in a given area will be lost after 13 years. The main causes of nest loss are nests blowing out of trees and nest trees succumbing to windthrow (Hodges 1982).

Perching sites are an important component of bald eagle nesting habitat. Bald eagles perch on tall trees and snags to scan the water and shore for food. They also use these vantage points to protect their nests from avian predators. Tall trees having a clear view of the nest and surrounding water provide the most valuable perching sites. Other functions of perch trees have been suggested. These include: 1) sites for consuming prey, 2) sites from which to display to attract potential mates, and 3) conspicuous posts from which territory occupation may be signaled (Stalmaster et al. 1985).

Inland Habitats

The mainland of southeast Alaska contains 12 major river systems and several minor river systems. These rivers are generally of glacial origin and flow in braided patterns over wide gravel beds on the valley floors. The more stable portions of these river bottomlands support stands of large, mature black cottonwood (Populus trichocarpa) trees that are used as nesting, roosting, and perching habitat by bald eagles (Hodges 1979; Hughes 1981).

Hodges (1979) found nest densities to be highly variable among the rivers surveyed in southeast Alaska. The use of river habitats for nesting may fluctuate from year to year in response to food abundance and weather conditions. The large mainland river systems of southeast Alaska supported

an estimated 200 bald eagle nests (Hodges 1979). Occasional nests also occur along major streams and lakes of the larger islands in southeast Alaska (e.g., Prince of Wales Island) (Hodges and Robards 1982).

Habitat Model

A number of factors have been identified as influencing the selection of nesting sites by bald eagles. However, adequate nest sites and proximity to water appear to be most critical in determining the value of a stand as nesting habitat for bald eagles. Characteristics associated with type of water body and shoreline are not easily represented in the Geographic Information System database. For these reasons emphasis in this model is placed on overstory, successional, and spatial relationships between bald eagles and their habitat.

Coastal Habitats

Sitka spruce trees typically dominate the old-growth forests of southeast Alaska. These trees provide the structure preferred by bald eagles for nest placement. Nearly 80 percent of 3,850 nest trees examined in southeast Alaska were Sitka spruce (Hodges and Robards 1982). Although approximately 20 percent of nest trees were western hemlock, this species is not preferred because it is generally shorter than Sitka spruce, is less persistent, and the terminal branching is much finer (Grubb 1976). Western redcedar, found throughout southern southeast Alaska, is rarely used as a nest tree because of it fine branching structure.

The value of a stand as bald eagle nesting habitat is, therefore, directly related to forest structure and composition. Sites with tall, well-developed canopy structure and a high percentage of Sitka spruce in the overstory will be preferred by bald eagles (Hodges and Robards 1982). Dominant overstory species of a stand may be used to represent the availability of preferred nest sites (Table 1). Stands with timber volumes greater than 8,000 boardfeet per acre generally provide nesting sites suitable for bald eagles. The suitability of open, muskeg forests (characterized by timber volumes of 8,000 boardfeet per area or less) as bald eagle nesting habitat is limited. Nonforested stands do not offer any opportunity for bald eagles to nest.

The average age of nest trees in southeast Alaska exceeds 400 years (Robards and Hodges 1976). Bald eagles in southeast Alaska prefer to nest in continuous stands of old-growth rather than in narrow leave strips of old-growth trees. Nests of bald eagles have not been found in second growth trees in southeast Alaska. These relationships

indicate a preference by bald eagles for stands of old-growth forest and avoidance of second growth stands and nonforested stands (Robards and Hodges 1976) (Table 1).

Bald eagles along the coast in southeast Alaska have a strong propensity to nest close to saltwater. Corr (1974) found a mean distance of nest tree to shore to be 100 ft (30 m) near Petersburg. Hodges and Robards (1982) reported the average distance of nests to the waterfront throughout southeast Alaska was 120 ft (37 m), with 92 percent of nest trees within 300 ft (90 m) and 98 percent within 600 ft (183 m) of the shoreline. Therefore, as distance from the shoreline increases, the value of the habitat for bald eagles decreases dramatically (Table 1).

Inland Habitats

Nests of bald eagles observed along rivers and lakes in southeast Alaska were located within the associated riparian zone (Hodges 1979). Riparian habitats have been described on the Tongass National Forest on the basis of channel type, soils, land form, and vegetation (Martin et al. 1986). Nesting habitats of bald eagles is assumed to be restricted to these riparian areas (Table 2).

Availability of fish as food for bald eagles is assumed to be a prime factor in the suitability as a riparian area as habitat for bald eagles. Streams that produce anadromous fish (i.e., class I) are assumed to be better foraging habitat for bald eagles than streams that only produce resident fish (e.g., cutthroat trout [Salmo clarki]) (i.e., class II). Streams that do not support any fish (i.e., class III) are assumed to not have any value as foraging habitat for bald eagles. Lakes greater than 50 ac (20 ha) are assumed to support more prey for bald eagles and provide more foraging opportunities than smaller lakes. Lakes and streams above 800 ft (245 m) elevation are assumed to provide less of a prey base than those below 800 ft (245 m) (Table 2). Anadromous fish are less likely to be present at higher elevations. Weather conditions in the spring are also less conducive to successful nesting at elevations above 800 ft (245 m).

The vegetation and successional stage relationships established for bald eagles in coastal habitats are assumed to also apply to lake and stream habitats (Table 2).

Habitat Capability

Coastal Habitats

Densities of active bald eagle nests in optimum habitat (i.e., Seymour Canal Eagle Management Area) have been estimated to be 0.50 active nests/mile (Hodges 1982). The

following calculations provide an estimate of the area of bald eagle habitat per linear measurement of coastline.

$$\frac{5280\ \text{ft(1 mi)}\times 500\ \text{ft (beach fringe)}}{43560\ \text{ft}^2/\text{ac}} = 60\ \text{ac/mi of beach fringe}$$

500 ft (150 m) is used as the depth of beach fringe because most bald eagle nests occur within this zone.

0.50 active nests/mile of coastline = 0.50 active nests/60 ac = 5 active nests/mi^2.

5 active nests/mi^2 = 10 breeding bald eagles/mi^2.

The mean proportion of adult bald eagles breeding in southeast Alaska from 1970 through 1979 = 0.38 (Hansen and Hodges 1985).

$$\frac{10\ \text{breeding bald eagles/mi}^2}{0.38} = 26\ \text{adult bald eagles/mi}^2\ \text{of optimum coastal habitat (i.e., HSI = 1.0)}$$

Unsuitable habitat (i.e., HSI = 0.0) is assumed to have a density of 0 bald eagles/mi^2. A linear relationship is assumed between bald eagle densities and habitat quality, as defined by HSI values, in order to calculate densities for intermediate HSI values (Table 1).

Inland Habitats

Densities of active bald eagle nests in optimum habitat adjacent to rivers, streams, and lakes (i.e., Chilkat River) have been estimated to be 0.39 active nests/mile (Hodges 1979). The following calculations provide an estimate of the area of bald eagle habitat per linear measurement of shoreline.

$$\frac{5280\ \text{ft (1 mi)}\times 500\ \text{ft(riparian zone)}}{43560\ \text{ft}^2/\text{ac}} = 60\ \text{ac/mi of shoreline}$$

500 ft (150 m) was assumed to be the average width of the riparian zone.

0.39 active nests/mile of shoreline = 0.39 active nests/60 ac = 4 active nests/mi^2.

4 active nests/mi^2 = 8 breeding bald eagles/mi^2.

The mean proportion of adult bald eagles breeding in southeast Alaska from 1970 through 1979 = 0.38 (Hansen and Hodges 1985).

$$\frac{8\ \text{breeding bald eagles/mi}^2}{0.38} = 21\ \text{adult bald eagles/mi}^2\ \text{of optimum inland habitat (i.e., HSI = 1.0)}$$

Unsuitable habitat (i.e., HSI = 0.0) is assumed to have a density of 0 bald eagles/mi^2. A linear relationship is assumed between bald eagle densities and habitat quality, as defined by HSI values, in order to calculate densities for intermediate HSI values (Table 2).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete imformation is available on nest locations. This will be done to ensure the model results approximate the results of independent field studies.

Efforts will also be made to verify and perhaps refine the assumed relationships between nest placement and volume class and and between nest placement and forest type.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

Other analyses to be completed on the GIS include determination of the composition of vegetation within 1.) the 330 ft (100 m) buffer zone around identified nest sites and 2.) wider buffer zones.

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Table 1. Capability of coastal habitats to support breeding bald eagles in southeast Alaska.

Habitat Volume Class	Distance from Shore 0-500 ft Index	0-500 ft #/sq. mi	> 500 ft Index	> 500 ft #/sq. mi
old-growth forests				
Sitka spruce				
Noncommercial	0.3	8	0.0	0
> 8000 bf/ac[a]	1.0	26	0.0	0
Western hemlock/ Sitka spruce				
Noncommercial	0.2	5	0.0	0
> 8000 bf/ac	0.8	21	0.0	0
Western hemlock				
Noncommercial	0.1	3	0.0	0
> 8000 bf/ac	0.5	13	0.0	0
Other				
Noncommercial	0.0	0	0.0	0
> 8000 bf/ac	0.1	3	0.0	0
Second growth forests	0.0	0	0.0	0
Other	0.0	0	0.0	0

[a]bf/ac = board feet per acre

Table 2. Capability of inland habitats to support breeding bald eagles in southeast Alaska.

Habitat / Overstory Species / Volume Class / Fish Production	Riparian Elevation 0-800 ft Index	#/sq. mi	Riparian Elevation > 800 ft Index	#/sq. mi	Not Riparian Index	#/sq. mi
old-growth forests						
Sitka spruce						
Noncommercial						
Class I stream[a]	0.2	5	0.0	0	0.0	0
Class II stream	0.1	2	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.1	2	0.0	0	0.0	0
Lake >50 ac	0.2	5	0.0	0	0.0	0
> 8000 bf/ac[b]						
Class I stream	0.8	21	0.1	2	0.0	0
Class II stream	0.3	8	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.2	5	0.0	0	0.0	0
Lake >50 ac	0.8	21	0.1	2	0.0	0
Western hemlock/ Sitka spruce						
Noncommercial						
Class I stream	0.2	5	0.0	0	0.0	0
Class II stream	0.1	2	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.1	2	0.0	0	0.0	0
Lake >50 ac	0.2	5	0.0	0	0.0	0
> 8000 bf/ac						
Class I stream	0.7	17	0.1	2	0.0	0
Class II stream	0.2	5	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.2	5	0.0	0	0.0	0
Lake >50 ac	0.7	17	0.1	2	0.0	0

Table 2 cont. Capability of inland habitats to support breeding bald eagles in southeast Alaska.

Habitat / Overstory Species / Volume Class / Fish Production	Riparian, Elevation 0-800 ft Index	#/sq. mi	Riparian, Elevation > 800 ft Index	#/sq. mi	Not Riparian Index	#/sq. mi
Western Hemlock						
Noncommercial						
Class I stream	0.1	2	0.0	0	0.0	0
Class II stream	0.1	2	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.0	0	0.0	0	0.0	0
Lake >50 ac	0.1	2	0.0	0	0.0	0
> 8000 bf/ac						
Class I stream	0.4	11	0.0	0	0.0	0
Class II stream	0.2	5	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.1	2	0.0	0	0.0	0
Lake >50 ac	0.4	11	0.0	0	0.0	0
Black cottonwood						
Class I stream	0.7	17	0.1	2	0.0	0
Class II stream	0.2	5	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.2	5	0.0	0	0.0	0
Lake >50 ac	0.7	17	0.1	2	0.0	0
Other old-growth						
Noncommercial						
Class I stream	0.0	0	0.0	0	0.0	0
Class II stream	0.0	0	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.0	0	0.0	0	0.0	0
Lake >50 ac	0.0	0	0.0	0	0.0	0
> 8000 bf/ac						
Class I stream	0.1	2	0.0	0	0.0	0
Class II stream	0.0	0	0.0	0	0.0	0
Class III stream	0.0	0	0.0	0	0.0	0
Lake <50 ac	0.0	0	0.0	0	0.0	0
Lake >50 ac	0.1	2	0.0	0	0.0	0

Table 2 cont. Capability of inland habitats to support breeding bald eagles in southeast Alaska.

Habitat / Overstory Species / Volume Class / Fish Production	Riparian Elevation 0-800 ft Index	Riparian Elevation 0-800 ft #/sq. mi	Riparian Elevation > 800 ft Index	Riparian Elevation > 800 ft #/sq. mi	Not Riparian Index	Not Riparian #/sq. mi
Second growth forests	0.0	0	0.0	0	0.0	0
Other habitats	0.0	0	0.0	0	0.0	0

[a]Class I streams support populations of anadromous fish.
Class II streams support populations of resident fish.
Class III streams do not support fish populations.

[b]bf/ac = board feet per acre

HABITAT CAPABILITY MODEL FOR RED-BREASTED SAPSUCKERS IN SOUTHEAST ALASKA: BREEDING HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of red breasted sapsuckers (*Sphyrapicus ruber*). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Breeding season habitat of red breasted sapsuckers is evaluated in the model. The red breasted sapsucker is considered a keystone species in southeast Alaska in that it is the primary excavator of cavities used by secondary cavity nesters in this area (Sidle and Suring 1986).

The breeding range of the red-breasted sapsucker extends from northern southeastern Alaska through western British Columbia and into western Washington and Oregon (Howell 1952). This bird winters in the coastal portion of its breeding range at least as far north as Prince of Wales Island (Howell 1952, Howell 1953). The distribution of this bird throughout southeast Alaska has been defined as uncommon to common (Kessel 1986, Sidle and Suring 1986).

Habitat Use

A very limited amount of work has been done on the red-breasted sapsucker. However, in a review of sapsuckers Howell (1952) concluded that there is very little difference in the life histories of the four forms. Information provided in studies of the red-naped sapsucker (*S. nuchalis*), the Williamson's sapsucker (*S. thyroideus*), and the yellow-bellied sapsucker (*S. varius*) will be used to provide a basis for the establishment of a habitat model for the red-breasted sapsucker.

Unlike most woodpeckers, sapsuckers feed on numerous items including sap, phloem, insects, and fruit (Tate 1969). Sapsuckers use several techniques to extract sap and phloem tissue from living trees (Tate 1973). They drill vertical columns of holes, horizontal bands of holes, and spiral groups of holes. All of the soft inner bark of trees-cork cambium, phloem (fibers, rays, sieve tubes, and parenchyma), and cambium is eaten by sapsuckers as well as sap. Sap is taken by sapsuckers by drinking, when it is concentrated, or by licking the sap, with their tongue, from the holes and

from the surface of the bark (Foster and Tate 1966). Sap is also transported to the nestlings (Kilham 1977).

Sapsuckers catch insects by foraging on the trunks and limbs of trees and gleaning them from the bark (Kilham 1977). They do not excavate bark for food (Stallcup 1968). They also take insects from leaves and occasionally catch them in mid air (Raphael and White 1984). Often a sapsucker will obtain a mouthful of insects, fly to the feeding tree, work the insects into the wet sap, and then either consume them or take them to the young (Kilham 1962, Foster and Tate 1966). A number of organisms, including insects, are attracted to the holes the sapsucker drills for sap. This provides a source of insects for the sapsuckers to consume or take to their young. One or 2 live trees within 300 ft (90 m) of the nest site serve as the food source throughout the breeding season (Howell 1952, Bull et al. 1986).

Nest sites of sapsuckers appear to be chosen for their proximity to suitable foraging habitat (Crockett and Hadow 1975) and for the characteristics of the individual nest tree (Bull et al. 1986). Sapsuckers always nested in or adjacent to open stands during a study in Colorado (Crockett and Hadow 1975). Breeding territories are established by sapsuckers that encompass nesting and feeding sites (Crockett 1975). Territories are often occupied by the same individuals from year to year. Territory size approximates 10 ac (4 ha) for this species (Jackman 1974).

Reported diameters at breast height of individual nest trees within territories range from 10 in (25 cm) to 32 in (80 cm) (Bull 1978, Raphael and White 1984). Although sapsuckers use smaller diameter trees, productivity of birds appears to increase if they are able to use larger diameter trees. Large diameter trees and snags allow space for excavation of larger diameter cavities. Clutch size of hole-nesting passerines has been shown to increase with increased cavity diameter (Karlson and Nilsson 1977). Larger diameter trees also provide thicker insulation around the nest cavity (Raphael and White 1984).

Sapsuckers excavate a new hole every year, possibly because of the accumulation of fecal matter (Kilham 1962, Kilham 1977). Although sapsuckers excavate only 1 nest hole per year, they may begin excavations on several trees before a final one is selected (Howell 1952, Jackman 1974). Often a tree which was used in a previous year is used again (Howell 1952). Nest trees are usually alive or have been dead less than 3 years (Bull et al. 1986). Since the sapsucker is a poor excavator (Spring 1986), it usually nests in trees with advanced decay in the heartwood (Shigo and Kilham 1968, Erskine and McLaren 1972, Miller et al. 1979).

Habitat Model

Hughes (1985) characterized red breasted sapsuckers as an early returning migrant on his study area in southeast Alaska. During March, these birds were closely associated with old-growth stands of western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*). He found that red breasted sapsuckers were approximately twice as abundant in low volume (i.e., 8-20,000 board ft/ac) old-growth stands as in mid and high volume stands (i.e., 20-30,000 board ft/ac and 30,000+ board ft/ac). Low volume stands provide the open habitat that has been reported as preferred by sapsuckers elsewhere (Crockett and Hadow 1975). Although mean snag diameters (i.e., 16 in - 40 cm) are smaller within the low volume stands than in mid and high volume stands (Hughes 1985) they are within the range of snag diameters reported as used by sapsuckers (Bull 1978, Raphael and White 1984).

The population densities reported by Hughes (1985) for red breasted sapsuckers are probably not adequate indicators of habitat preference during the breeding season. These densities were determined during late winter and early spring which may have been before breeding territories were established. Presence of cavities is probably a better indicator of habitat preference by red breasted sapsuckers. The number of snags with excavated cavities per plot by volume class was calculated from data provided in Hughes (1985) (Table 1). These values were used to provide an index to habitat quality (Table 2). Muskeg forests generally have small diameter, widely spaced trees that are not preferred by woodpeckers. Black cottonwood (*Populus trichocorpa*) forests may provide suitable nesting sites but foraging opportunities may be limited in deciduous trees early in the year before sap is available so their value is decreased slightly (Tate 1973). Red alder (*Alnus rubra*) forests tend to have small diameter trees with limited nest sites available. This is reflected in their low suitability index values. Adequate nest sites are unavailable in other habitats in southeast Alaska (Hughes 1985).

Habitat Capability

Hughes (1985) reported an early spring density of 134 red breasted sapsuckers/mi^2 (52/km^2) in low volume old-growth stands. Densities of 80 and 67 red breasted sapsuckers/mi^2 (31 and 26/km^2) were observed for mid and high volume old-growth stands, respectively. The density reported for low volume old-growth is assumed to be the number of birds supported in optimum habitat (i.e., suitability index = 1.0) (Table 1). The densities for all other habitats are calculated using this value as a base.

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on red breasted sapsuckers. This will be done to ensure the model results approximate the results of field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Development of suitability index values by volume class for red breasted sapsuckers in southeast Alaska[a].

Volume Class	Number of Plots	Number of Snags With Cavities	Snags with Cavities per Plot
30,000+ bf/ac[b]	40	25	0.63
20-30,000 bf/ac	24	20	0.83
8-20,000 bf/ac	31	31	1.00

[a]Data were taken from Hughes (1985).

[b]bf/ac = boardfeet/acre; Hughes (1985) classified forest stands with slightly different volume classes (i.e., 40,000 bf/ac, 25,000 - 40,000 bf/ac, and 8 - 25,000 bf/ac). The volume classes used here are those in the Geographic Information System database being developed for southeast Alaska.

Table 2. Capability of habitats to support red-breasted sapsuckers during spring and summer in southeast Alaska.

Habitat	Suitability Index	Number per Square Mile[a]
old-growth forest		
Western hemlock, Sitka spruce, cedar, W. hemlock/spruce		
30,000+ bf/ac[b]	0.6	80
20-30,000 bf/ac	0.8	107
8-20,000 bf/ac	1.0	134
Muskeg (noncommercial)	0.1	13
Subalpine	0.3	40
Black cottonwood	0.8	107
Red alder	0.2	27
Clearcut (0-25 yrs)	0.0	0
Second growth (> 25 yrs)	0.0	
Other	0.0	0

[a] Densities are calculated from Hughes (1985) (see Table 1).

[b] bf/ac = boardfeet/acre; Hughes (1985) classified forest stands with slightly different volume classes (i.e., 40,000 bf/ac, 25,000 - 40,000 bf/ac, and 8 - 25,000 bf/ac). The volume classes used here are those in the Geographic Information System database being developed for southeast Alaska.

HABITAT CAPABILITY MODEL FOR HAIRY WOODPECKERS IN SOUTHEAST ALASKA: WINTER HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of hairy woodpeckers (Picoides villosus). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Winter range of hairy woopeckers is evaluated in the model.

Work by Raphael and White (1984) suggested that an important constraint on cavity nesting birds, including hairy woodpeckers, is the availability of suitable winter habitat for roosting and foraging. Haapanen (1965:190) stated that "severe weather and lack of food is the most decisive factor limiting populations of the (hole nesting) species wintering in conifer stands." Manuwal and Huff (1987) also observed that the most impact from intensive timber management will be on resident species that require tree cavities.

The range of the hairy woodpecker extends from Alaska, through most of Canada, and throughout the lower 48 states and Mexico (Robbins et al. 1966). This bird is considered an uncommon, permanent resident throughout southeast Alaska (Sidle and Suring 1986). The hairy woodpecker is associated with snags and partially dead trees for foraging and nesting and represents cavity nesters. Hairy woodpeckers are generally declining in numbers in the Pacific Northwest and deserve special attention (Morrison and Morrison 1983).

Habitat Use

The diet of hairy woodpeckers consists primarily of adult and larval beetles, ants, and caterpillars (Beal 1911, Bent 1939). Animal matter makes up approximately 80 percent of this woodpeckers diet which is supplemented with fruit, nuts, and seeds (Martin et al. 1951, Stallcup 1969, Hardin and Evans 1977). Hairy woodpeckers often concentrate in areas of insect outbreaks in response to the increased food available (Koplin 1969). Their numbers also decline significantly once the available insect prey densities decline.

Mature, uneven-aged timber stands with many dead snags receive substantial use for foraging by hairy woodpeckers

(Conner and Crawford 1974). They generally feed on insects on the surfaces of snags, the dead parts of live trees, and occasionally live trees during the summer (Yeager 1955, Conner and Crawford 1974, Conner 1979a). Hairy woodpeckers forage during the summer by pecking on the foraging substitute without penetrating the subcambium (Conner 1979a). During the winter, hairy woodpeckers increase their use of large limbs and trunks of dead trees and dead portions of live trees (Conner 1980, Morrison et al. 1985). They also use foraging methods that penetrated tree surfaces deeper and disturbed the substrate more than during milder seasons (Conner 1979a). In the winter when ants and insect pupae are under the bark or inside the cambium and other insects are not present in large numbers on the surface of trees, woodpeckers must excavate in search of prey (Conner 1979a).

Hairy woodpeckers have been observed foraging on snags and on logs and branches left as slash in recent clearcuts (i.e., 1-5 years old) (Conner and Crawford 1974, Dickson et al. 1983). However, these birds immediately returned to the adjacent uncut forest after foraging. These habitats are generally unavailable during the winter because of snow or provide unsuitable microhabitats because of cold weather.

Male and female hairy woodpeckers tend to segregate their foraging niches by utilizing different substrates and different techniques (Kisiel 1972). Females have been observed to forage more frequently on branches and live trees than males (Lynch 1978). The smaller-billed females tend to forage superficially in these areas by gleaning or scaling bark in contrast to the deep excavations into wood performed by males (Kisiel 1972, Morrison and With 1987).

The females establish territories in the fall and attract males to these areas in the spring (Shelley 1933, Kilham 1966, Kilham 1969). Territories tend to be established with consideration to availability of nest sites rather than foraging opportunities. Hairy woodpeckers nest in both live and dead trees but all nest trees in one study were infected by heart rot (Conner and Adkisson 1976).

Hairy woodpeckers and associated secondary cavity nesters generally nest in large trees (Kelleher 1963, Jackson 1975, McClelland 1977, Scott et al. 1977, Mannan et al. 1980, Zarnowitz and Manuwal 1985). Smaller diameter trees provide suboptimal nest sites with the effect of reducing reproductive success and eventually reducing population sizes (Dennis 1969, Conner 1979b, Raphael and White 1984). Sizes of nest trees reported as used by hairy woodpeckers ranges from 12 to 23 in diameter at breast height (30 to 58 cm) (Evans and Conner 1979, Zarnowitz and Manuwal 1985).

Hairy woodpeckers have been reported to prefer habitats with high tree basal area, tall canopy, large diameter trees, and nest cavities that are high above the ground (Conner and Adkisson 1977). During the winter, hairy woodpeckers become much more specialized in the habitats they select (Conner 1981). Habitats used during the winter were characterized by a high, heavy canopy cover provided by large, widely spaced trees and with cover in the subcanopy (Morrison et al. 1986).

Habitat Model

Hughes (1985) found hairy woodpeckers associated with old-growth stands of western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*) in southeast Alaska. old-growth forests with greater than 30,000 board ft/ac (i.e., high volume) were preferred (Table 1). These forests provide the components identified with high quality habitat for hairy woodpeckers. Although approximately 0.2 of the number of hairy woodpeckers observed in high volume stands were observed in low and mid volume stands (i.e., 8-20,000 board ft/ac and 20-30,000 board ft/ac respectively) mid volume stands were assigned a higher index value because of the greater availability of snags and other suitable habitat conditions.

Muskeg, or noncommercial, forests generally have small diameter, widely spaced trees that are not preferred by woodpeckers. Black cottonwood (*Populus trichocarpa*) forests may provide suitable nesting sites but they provide limited winter habitat. Early clearcuts may provide some foraging opportunities but these habitats are generally unavailable to hairy woodpeckers in the winter. During the regeneration stage of even-aged timber management, forests have little potential for hairy woodpecker habitat (Conner et al. 1975). Snags that develop in second growth stands are not used by cavity nesters because they are generally too small for excavation (Chadwick et al. 1986). Remnant snags in second growth stands receive very little use by woodpeckers because of the high stem density of trees which is unsuitable for woodpeckers (Mannan et al. 1980).

Habitat Capability

Hughes (1985) reported a winter density of 32 hairy woodpeckers/mi^2 (12/km^2) in high volume old-growth stands and a density of 5 hairy woodpeckers/mi^2 (2/km^2) in low and mid volume old-growth stands (Table 1). Zarnowitz and Manuwal (1985) reported significant higher densities in old-growth stands on the west side of the Olympic Peninsula in Washington State (i.e., 80/mi^2 [32/km^2]).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on winter densities of hairy woodpeckers. This will be done to ensure the model results approximate the results of field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Capability of habitats to support hairy woodpeckers during the winter in southeast Alaska.

Habitat	Suitability Index	Number per Square mile[a]
old-growth forest		
Western hemlock, Sitka spruce, cedar, W. hemlock/spruce		
30,000+ bf/ac[b]	1.0	32
20-30,000 bf/ac	0.6	19
8-20,000 bf/ac	0.2	6
Noncommercial	0.0	0
Subalpine	0.0	0
Black cottonwood	0.1	3
Clearcut (0-25 yrs)	0.0	0
Second growth (> 25 yrs)	0.0	0
Nonforest	0.0	0
Other	0.0	0

[a]Densities are from Hughes (1985).

[b]bf/ac = boardfeet/acre; Hughes (1985) classified forest stands with slightly different volume classes (i.e., 40,000+ bf/ac, 25,000 - 40,000 bf/ac, and 8 - 25,000 bf/ac). The volume classes used in this model are those available in the Geographic Information System database for southeast Alaska.

HABITAT CAPABILITY MODEL FOR BROWN CREEPERS IN SOUTHEAST ALASKA: WINTER HABITAT

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the current Forest plan. These models will be used to assist in the evaluation of effects of proposed land management activities on wildlife habitats and populations. The objective of this model is to estimate the capability of habitats in southeast Alaska to support populations of brown creepers (Certhia americana). The model provides an evaluation of habitat quality which is assumed to be related to long-term carrying capacity. The model is developed to be applied throughout southeast Alaska. Winter range of brown creepers is evaluated in the model. Work by Raphael and White (1984) suggested that an important constraint on cavity nesting birds, including brown creepers, is the availability of suitable winter habitat for roosting and foraging. Haapanen (1965:190) stated that "severe weather and lack of food is the most decisive factor limiting populations of the (hole nesting) species wintering in conifer stands." Manuwal and Huff (1987) also observed that the most impact from intensive timber management will be on resident species that require tree cavities.

The range of the brown creeper extends from south central Alaska, through southeast Alaska, into the western Canadian Provinces, across southern Canada, and throughout the lower 48 states and northern Mexico (Robbins et al. 1966). This bird is considered an uncommon, permanent resident throughout southeast Alaska (Sidle and Suring 1986). The brown creeper is associated with large, old-age trees and represents the old-growth forest community.

Habitat Use

The diet of brown creepers consists of larvae, pupae, and eggs of insects gleaned from the crevices of bark; spiders; other small invertebrates; and occasionally seeds (Pearson 1923, Reilly 1968). The brown creeper uses its long (0.6 in - 15 mm), slightly decurved bill to pick food items from cracks and crevices in the bark and off the bark surface without disturbing the bark (Davis 1978). This bird typically flys to the base of a tree and searches for food on the bark in an upward spiral pattern (Franzreb 1985).

Large diameter trees are preferred because a bird can feed longer on a large tree and capture more prey per visit (Raphael and White 1984, Airola and Barrett 1985). Larger diameter trees produce more beetle larvae per unit surface area than smaller trees (Parker and Stevens 1979). Jackson

(1979) also showed that furrowed bark of larger trees supported larger numbers of insects than did the smoother bark of smaller trees. Brown creepers and other bark foraging birds also select larger diameter trees as foraging sites during cold, windy weather to lessen their exposure (Willson 1970, Grubb 1975, Webber 1986).

Brown creepers forage almost exclusively on trunks of trees in conifer forests (Morse 1970). They tend to move to another tree when the branch density increases to a point that the maneuverability of the bird is impaired (Franzreb 1985). The birds select tall trees that provide more room for foraging before branches are encountered. The size of a tree is more of a determinant in the selection of foraging sites than the species of a tree. The abundance of large, course-barked trees and the length of vertical foraging height appears to affect the territory size of brown creepers (Apfelbaum and Haney 1977). The area necessary to support the birds increased as the number of large, tall trees decreased. Brown creepers also spend the majority of their time foraging on live trees or on the live parts of trees rather than on dead trees (Raphael and White 1984, Morrison et al. 1987).

The brown creeper places its nest between the bark and trunk of a dead or dying tree where the bark has pulled away from the tree (Davis 1978). All of the brown creeper nests located by Davis (1978) and Raphael and White (1984) were in spaces behind the bark. However, Kelleher (1963) found brown creepers using abandoned woodpecker nest cavities on Vancouver Island, British Columbia. Large snags are also important as roosting sites for brown creepers (Walsberg 1986).

Habitat Model

Hughes (1985) found brown creepers associated with old-growth stands of western hemlock (Tsuga heterophylla) and Sitka spruce (Picea sitchensis) in southeast Alaska. old-growth forest with greater than 30,000 board feet/acre (i.e., high volume) were highly preferred. These forests provide the components identified with high quality habitat for brown creepers (i.e., large diameter, tall trees). Such forest stands are considered optimum habitat for brown creepers (Table 1). Slightly more than 0.1 of the number of brown creepers observed in stands with 30,000+ board feet/acre were observed in stands with 20-30,000 board feet/acre (i.e., mid volume) (Hughes 1985). Other habitats in southeast Alaska were not considered to provide habitat for brown creepers. Studies of the response of birds to timber harvest have shown significant reductions of populations of brown creepers from old-growth forests to clearcuts (Franzreb 1977, Franzreb and Ohmart 1978, Scott and Gottfried 1983, Medin 1985).

Habitat Capability

Hughes (1985) reported a winter density of 96 brown creepers/mi^2 (37 brown creepers/km^2) in high volume old-growth stands and a density of 13 brown creepers/mi^2 (5 brown creepers/km^2) in mid volume stands (Table 1). Buchner et al. (1975) reported similar densities for breeding brown creepers on Vancouver Island in old-growth forests (i.e., 90 and 64 birds/mi^2 [36 and 24 birds/km^2]). A similar average density (i.e., 74 brown creepers/mi^2 [29 brown creepers/km^2]) was also reported from mature forests in northeast California (Raphael and White 1984).

Verification

This draft of the model has received limited review by biologists from the Alaska Department of Fish and Game, US Fish and Wildlife Service, and USDA Forest Service located in southeast Alaska.

The next step in verification of the model will be implementation in a pilot test of the Geographic Information System (GIS) database currently being developed for southeast Alaska by the USDA Forest Service. The purpose of this limited test is to ensure that the model provides reasonable results on the pilot test area. Once the complete GIS database is available for use the model will be run on other areas in southeast Alaska for which more complete information is available on brown creepers. This will be done to ensure the model results approximate the results of field studies.

Once these aspects of verification are completed reviews of the model will be requested from species experts not associated with development of the model.

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Table 1. Capability of habitats to support brown creepers during the winter in southeast Alaska.

Habitat	Suitability Index	Number per Square mile[a]
Old-growth forest		
Western hemlock, Sitka spruce, cedar, W. hemlock/spruce		
30,000+ bf/ac[b]	1.0	96
20-30,000 bf/ac	0.1	3
8-20,000 bf/ac	0.0	0
Muskeg	0.0	0
Subalpine	0.0	0
Black cottonwood	0.0	0
Clearcut	0.0	0
Second growth	0.0	0
Other	0.0	0

[a]Densities are from Hughes (1985).

[b]bf/ac = boardfeet/acre; Hughes (1985) classified forest stands with slightly different volume classes (i.e., 40,000+ bf/ac, 25,000 - 40,000 bf/ac, and 8 - 25,000 bf/ac). The volume classes used here are those present in the Geographic Information System being developed for southeast Alaska.

These habitat capability models were run of the Forest's Geographic Information System. The GIS data base contains spatial information of the existing rezsource condition on the forest. It contains data on slope, vegetation, soil type, elevation, beach, riparian, recreation places, roads and other resource information. All total there are 43 different layers of information in the data base. The result of running the habitat capability models on the GIS data base was the assignment of a habitat suitability index and population estimate to each 20 acre polygon on the Forest for each of 13 MIS. The GIS data base was then used

to calculate the average HSI value for each of the 379 analysis areas used in the FORPLAN model. The analysis areas were hooked in the FORPLAN Model to their appropriate HSI value either through level identifiers as in Martin, Sitka Black Tailed Deer, Red-Breasted Sapsucker, and Black Bear or as analysis area aggregates for Bald Eagles, River Otters, Hairy Woodpeckers, Brown Bears, Red Squirrels, and Brown Creepers. In this manner every analysis area was defined in terms of its current habitat suitability index. Since the old-growth stands on the Tongass are considered to be in a steady state their HSI's do not change over time unless harvested. Yield tables were then input into FORPLAN depicting this steady state HSI for each old-growth analysis area. Change in HSI after harvest was also calculated using the Habitat Capability Models. This change over time with a reduction in HSI was calculated from the Habitat Capability Models until stands returned to their old-growth condition (approximately 200 years). These regenerated yields for each analysis area and MIS were incorporated into FORPLAN based on their existing HSI. In this manner HSI values developed jointly by the GIS data base and the Wildlife Habitat Capability Models for each MIS were included into FORPLAN. Since FORPLAN had input the average HSI for existing analysis areas, and how that HSI would change over time after harvest, the model was able to predict change in HSI for each species over time.

HABITAT CAPABILITY MODEL FOR DOLLY VARDEN CHAR AND COHO SALMON

Introduction

Habitat capability models are needed for each of the management indicator species selected for use in the revision of the Tongass Land Management Plan. To represent aquatic species, three management indicator species have been selected: pink salmon (Oncorhynchus gorbuscha Walbaum 1792), to represent anadromous fish whose populations are generally limited by spawning habitat availability; coho salmon (Oncorhynchus kisutch Walbaum 1792), to represent anadromous fish whose populations are generally limited by rearing habitat availability; and Dolly Varden char (Salvelinus malma Walbaum 1792), to represent habitat required by non-anadromous species. The historic range of coho salmon and Dolly Varden char includes all of Southeast Alaska and the Tongass National Forest.

Models are used to assist in the evaluation of effects of current and proposed land management activities on fish and wildlife habitats and populations. The cumulative effects of land management activities are also evaluated through the use of models. The objectives of the models described are to estimate the capability of habitats in southeast Alaska to support populations of Dolly Varden char and coho salmon and to predict changes in their capability based on differing land management strategies.

Habitat Capability

Habitat capability is the carrying capacity or the maximum numbers of fish the habitat can produce, whereas the population is the actual number of fish present at a given time. Populations tend to fluctuate naturally due to a wide range of factors, including harvest, climate, and species interactions, while habitat capability tends to remain relatively constant. Populations of coho salmon in Southeast Alaska have varied dramatically during the past 100 years, as evidenced by the commercial salmon harvests for coho salmon. The peak annual harvest occurred in 1986, the peak 10 year average in 1946, and the peak 25 year average in 1939. The recent harvest trends of the 10 and 25 year averages has been upward. There is no evidence that habitat capability has varied as dramatically as the populations have over the same time period.

Since populations of fish fluctuate greatly due to a variety of factors including fish harvest, off-shore survival, and on-shore survival, effects of forest management on fish

numbers can be very difficult to distinguish. This has led to the formulation of habitat capability models.

Habitat capability, for fish, is measured in smolts for anadromous fish and in numbers of fish for resident species (fish that remain in freshwaters their entire life). Smolts are the "final" output from National Forest system lands to the ocean. The Forest Service has very little control of, or effect on, fish survival once they leave the National Forest boundary. Even in freshwaters, habitat capability can vary widely year to year based on climatic events, such as severe winter freezing or summer drought.

The evaluations for coho salmon and Dolly Varden char include two steps. First, the potential habitat capability of Forest habitats is estimated. The second step estimates the effects of management activities, such as timber harvest, on the potential habitat capability.

Bases for models

The models developed are based on the channel type/stream class inventory on the Tongass National Forest. Individual channel types have fairly consistent physical and biological characteristics. The channel types provide a system to inventory the amount and quality of fish habitat and can be used to predict their physical response and sensitivity to different management activities. These models assume a relationship between fish habitat capability and stream physical characteristics (channel type). Streams located in the lower portions of a watershed or at tidewater (the C and E channels) typically have the highest capability. Mid-watershed channels (B channels) generally have a lower capability, while the highest gradient channels in the upper portion of the watershed (A channels) have the lowest productivity. The relationship between productivity of the B, C and E channels may change seasonally.

Steve Paustian (Tongass National Forest, Chatham Area, Sitka) developed estimates of smolt habitat capability for the old-growth condition, based on all population estimates that could be found and attributed to a specific stream channel type in Southeast Alaska. The population estimates were made by National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the Alaska Department of Fish and Game, and the USDA Forest Service, including the Forestry Sciences Laboratory of the Pacific Northwest Forest and Range Experiment Station. For each location, where population estimates were made, the channel type was determined. Further documentation on the development of this data and correlation to channel type is in preparation by Paustian.

One important consideration about the population estimates for each channel type is that they were made using data collected from streams in old growth, but not necessarily in a fully seeded state. No assumptions were made about what percentage of full seeding the empirical data represents. Therefore it is possible that the population estimates are, in fact, substantial underestimates of full habitat capability.

Work by Dolloff and Reeves[1] has shown that these channel type - fish habitat relationships may not be statistically valid when considering a limited data set (the relationship between only specific channel types). However, the group participating in this modeling effort was of the opinion that there is a relationship between channel type and fish habitat capability and that this relationship is a viable predictor of capability.

In addition to channel type, streams have been categorized by stream class. Three classes have been identified: I, II, and III. These stream classes correspond to the Aquatic Habitat Management Units identified in the Forest Service's Aquatic Habitat Management Handbook and the Fish Habitat Management Units described in the Alaska Regional Guide. They are defined as follows:

Class I: Streams with anadromous (fish ascending from oceans to breed in freshwater) or adfluvial (fish ascending from freshwater lakes to breed in streams) lake and stream habitat. Also included is the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations.

Class II: Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.

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[1]Dolloff, C. Andrew and Gordon Reeves. 1989. Visual estimation of habitat distribution and relative fish abundance in Southeast Alaska watersheds. Paper presented at the 119th Annual Meeting of the Am. Fish. Society, Anch., AK, Sept. 4-8, 1989. Abstract published.

Class III Streams with no fish populations but have potential water quality influence on the downstream aquatic habitat.

In the context of fish modeling, stream classes are used: 1) to establish the number of miles of different streams which provide anadromous and resident fish habitat, and 2) to help quantify the amount of timber harvest available from the riparian area resulting from the application of different management prescriptions and alternatives.

The habitat capability models are in two parts: the capability model that indicates the numbers of fish that the habitat could produce in the pristine, old-growth condition, without any manipulation, and the effects model that predicts the revised capability based on habitat changes. The effects model can be used to predict changes into the future.

Models

Murphy et al.[2] and Heifetz et al.[3] indicate that coho salmon and Dolly Varden char production are correlated to woody debris and pool volume in streams in Southeast Alaska. The pool volume is largely a function of woody debris, where woody debris is present. Other in-stream structure also forms pools and contribute to production capability, especially for coho salmon. Murphy et al. shows that Dolly Varden correlation with instream debris is .77 and with pool volume .30, leading to the conclusion that instream debris, per se, may be more important than just pool volume. For coho salmon, the correlation with instream debris is .56 and with pool volume is .79, leading to the conclusion that pool volume may be more important than instream debris, although instream debris to some degree is correlated with pool volume. This model, then, shows fish habitat capability changes based on pools, with the changes in pools based on those pools dependent on their formation by large woody debris.

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[2]Murphy, Michael l., Jonathan Heifetz, Scott W. Johnson, K V. Koski, and John F. Thedinga. 1986. Effects of Clear-cut Logging with and without Buffer Strips on Juvenile Salmonids an Alaska Streams. Can. J. Fish. Aquat. Sci., Vol. 43.

[3]Heitz, Jonathan, Michael L. Murphy and K V Koski. 1986. Effects on winter habitat of juvenile salmonids in Alaskan Streams. N. Am. Jrl. of Fish Mngmt. Vol. 6. pp. 52-58.

When considering woody debris, the concept of the presence of a "key piece" of woody debris which holds other woody debris in place is used. The key piece will contribute to the formation of pools, by holding smaller pieces in place and forming small debris dams. If the key piece is present, then sufficient other size classes of wood are retained to provide for sustained, functioning woody debris. Not only will the debris form pools, but it will also provide other necessary functions of woody debris. For all streams, except C1 and C3 channel types, the modeling group recognized that typically a 24 inch log greater than 10 feet in length was the key piece size. For the large C1 and C3 channel types, a 36 inch piece is the key size (greater than 10 feet). The modeling group recognized that some stream channels may have variations on the key piece size, but that this information is not now available.

The model depends on an input-output model, where:

Total woody debris (key pieces) at time t+1 = woody debris at time t plus additional woody debris added over the time from t to t+1 minus the woody debris lost over the time from t to t+1

or

woody debris$_{t+1}$ = woody debris$_t$ + additional debris (t to t+1) - lost debris (t to t+1)

In old growth, where theoretically an equilibrium state exists, input and output of debris are assumed constant. In the managed state, where stream-side timber harvest changes the input rate of debris, this relationship will change. So, for this model, it is only necessary tocalculate the input rate from time t to t+1 of second growth, versus the output during the same period of time under each management regime (prescription).

Output rate

The output, or loss, of wood has been estimated[4] as the exponential function e^{-kt} where k is a constant rate of decay (called decay but which can include biological decay, loss of material due to grinding of rocks, and other natural

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[4]Harmon, M.E., J. F. Franklin, F. J. Swanson. Ecology of Coarse Woody Debris in Temperate Ecosystems. In : Advance in ecological research. London; New York: Academic Press. Vol. 15. pp. 132 and Murphy, Michael L. and K V Koski. In Press. Input and depletion of Woody Debris in Alaska Streams and Implications for Streamside Management. N. Am. Journ. Fish Mngt. (to be published 1990).

events) and t is the time period from time "t" to time "t+1". The constant rate of decay is estimated from empirical data collected in old growth stream habitats from various channel types. Different channel types would be expected to exhibit different rates of decay due to their different morphologies. High gradient, relatively sterile streams may have a lower biological decay rate than a low gradient, slow moving stream, but would be expected to have a greater rate of material loss due to bedload erosion.

Estimates for the different channel types of the constant "k" were obtained from Murphy[5] The output portion of the model assumes that a large woody debris "key piece" provides instream benefits throughout its entire period of decay. In fact, there is some point at which a piece of large woody debris has decayed to such a small size that it no longer functions as a key piece (and, following further decay, that piece no longer functions as any size of large woody debris).

Input rate

Woody debris input is somewhat more complex to calculate than output, due to the variable nature of streamside forest productivity.

To calculate the input rate of woody debris in second growth, as discussed previously, it is first assumed that the decay rate in streams (removal rate) in old growth is equal to the input rate in old growth. This is a reasonable assumption because old-growth is in a steady state, with essentially a constant standing volume, rate of decay and accumulation of woody debris on the ground. Based on this assumption, when the input rate for large woody debris changes in second growth, as compared to old-growth, the effect of this change can be expected to be proportional to the change in input rates.

To calculate the input rate (IR) of trees of key piece size (24 or 36 inch trees, 24" used in the sample below) in second growth, per year per foot of stream, the following relationship is used:

Input Rate (IR) 2nd Growth (trees/yr/ft) =

$$\text{Old Growth IR (trees/yr/ft of stream)} \times \frac{\text{\# trees/acre >= 24" in 2nd growth}}{\text{\# trees/acre >= 24" in old growth}}$$

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[5] Personal communication with Michael Murphy, National Marine Fisheries Services, date: March 8, 1989; and Murphy, Michael L. and K V Koski. In press. Input and Depletion of Woody Debris in Alaska Streams and Implications for Streamside Management. N. Am. Journ. Fish Mngmt. (to be published 1990).

If there were the same number of 24 inch trees in 2nd growth as in old growth, then the input rate for 2nd growth and old growth would be equal. However, if the input rate is less in 2nd growth than old growth, as is normally the case for at least the first 100 years, then the input rate is proportionally less for 2nd growth as compared to old growth. The productivity of the land abutting the stream is a key to the period of time it would take for second growth to result in the same number of trees as old growth.

Tree growth which eventually supplies woody debris to the stream is dependent on the forest's inherent productivity. Since the number of trees that may enter the stream must be compared to the old growth situation, it is necessary to be able to predict the numbers of trees available, greater than or equal to the key piece size after a given period of time. Intuitively, each channel type should exhibit a different inherent level of productivity.

Initially, an analysis was made with the data in the Tongass National Forest's Geographical Informational System (GIS) to try to calculate an average site productivity next to a stream, by channel type, based on volume classes. It was thought that the site productivity could be used to estimate growth of trees. An analysis using GIS was completed, but appeared to make very little intuitive sense, and was not consistent with vegetative productivity measures taken at stream channels.

The reason probably resulted from the size of the vegetative plots, in relationship to the size of the riparian buffer. With vegetative plots that are at least 5 acres in size, and more often 10-20 acres, the stream buffer only incorporates a small portion of each of the polygons. The productivity call for the polygons was based on the average in the entire polygon, therefore if there was a higher productivity next to the stream (which is usually the case), this increased productivity was averaged across the entire polygon. This tended to decrease the productivity measured next to the stream. Therefore, it appeared inappropriate to use the timber type GIS information (volume class) as a measure of productivity for the regrowth of timber.

Edgington et al.,[6] with the Alaska Department of Fish and Game, has collected data on riparian plant associations and

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[6]Edgington, John, Marianna Alexandersdottir, Craig Burns, and James Cariello. 1987. Channel type classification as a method to document anadromous salmon streams. Informational leaflet No. 260, March 1987. Alaska

productivity associated with stream channels during channel type field inventories. He had included in his sampling data many of the different channel types. This data was divided into high, medium, and low productivity classes. Typically the low gradient drainages included higher productivity classes, while the higher gradient incised streams included lower productivity class. Intuitively this was expected.

The rate of regrowth of trees greater than or equal to 24 or 36 inches in size is estimated by interpretation of the tables in Taylor.[7] Taylor shows the number of trees per acre by age class in a number of different site indices. To use Taylor, a site index of 70 for low site, site index of 110 for medium site and site index of 130 for a high site was recommended. During the implementation of the models on the computer, it became apparent that forecasts for second growth to 210 years following harvest were necessary. Estimates for these later years were made.

The final data needed to calculate the rate of input to the stream system, as compared to the old growth system, is the number of large woody debris pieces per linear foot of stream per year entering the stream. The mechanics of how trees enter a stream is important. Murphy et al.[8] identifies the sources of woody debris to streams. This publication indicates that the majority (78 percent) of large woody debris enters through erosional processes (e.g. streambank undercutting and landslides) and windthrow. Itshows that relatively small amounts come from natural mortality of falling trees (21 percent). With this knowledge, it is assumed that mortality is not a major factor and, therefore, modeling of mortality (falling dead trees) is not necessary. Since most of the trees come from random windthrow and stream erosion, these forms of woody debris entry into a stream should be relatively constant in both old-growth and second growth given an equal number of source trees.

Dept. of Fish and Game, Div. of Commercial Fisheries, Juneau, Ak. 70 p.

[7]Taylor, R. F. 1934. Yield of second-growth western hemloch-sitka spruce stands in Southeastern Alaska. Technical Bulletin No. 412, United States Department of Agriculture.

[8]Murphy, Michael L., J. Mitchel Lorenz, Jonathan Heifetz, John F. Thedinga, K V Koski, and Scott W. Johnson. 1987. The relationship between stream classification, fish, and habitat in Southeast Alaska. WIldlife and Fisheries Habitat Management Notes, Tongass National Forest R10-MB-10. U.S. Department of Agriculture, Forest Service. 63p.

Since the volume entering a stream in a natural, old growth, system is equal to the volume resulting from the rate of decay (K), this rate of decay times the number of stems of large woody debris per linear foot in old growth is equal to the large woody debris rate of input in old growth per foot per year.

This was expressed in the equation, as shown above:

$$\text{Input Rate (IR) 2nd Growth (trees/yr/ft)} =$$

$$\text{Old Growth IR (trees/yr/ft of stream)} \times \frac{\text{\# trees/acre} >= 24\text{" in 2nd growth}}{\text{\# trees/acre} >= 24\text{" in old growth}}$$

Old growth input rate in trees/yr/ft of stream is calculated as:

k (decay rate) x #/linear foot of LWD >= 24 inches

If the decay rate were .02 and the number of LWD pieces greater than or equal to 24 inches and 10 feet in length were .02 per linear foot, then the LWD input rate in old growth would be .0004/ft/year.

Rearing dependence on woody debris formed pools

To this point it has been assumed that pools are formed entirely by woody debris, and it is this habitat variable that supplies over wintering (smolt) rearing capability. In fact all stream channels are not alike. Some streams are much more dependent than others on large woody debris to form instream pools. Where pools are not formed by large woody debris, often large boulders and undercut banks form pools. Typically, pools in high gradient streams are formed by large rock and boulders, while low gradient channel pools are formed by woody debris and undercut banks.

This model assumes that only those pools formed by woody debris are affected by the sources of woody debris. Pools formed by other means will rear a constant number of fish, independent of large woody debris, and will be held as a constant through this model. These percentages were calculated by Russell.[9] Russell's data did not document large woody debris formed pools for all channel types. For the other channels, estimates were either made with best

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[9] Russell, Scott. USDA Forest Service, Tongass National Forest, Ketchikan Administrative Area, 1989.

unpublished data developed by John Edgington, AK Dept. of Fish and Game, during the 1988 field season, or by those with expert knowledge of the the channel types and comparison to percentages for similar channel types. Heifetz et al.[10] confirm that pools result from a number of sources (such as large organic debris, undercut banks, and cobble substrates) and are present at different percentages based on the presence or absence of clearcut harvest.

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[10] Heifetz, Jonathan, Michael L. Murphu and K V Koski. 1986. Effects of logging on winter habitat of juvenile salmonids in Alaskan streams. N. Am. Jrl. of Fish. Mngmt. Vol. 6. pp. 52-58.

Woody Debris Input Changes by Prescription

Different management area prescriptions have been proposed for managing the Tongass National Forest in the Tongass Land and Resource Management Plan Revision. They were specifically developed to insure that the Forest could adequately address the issues and concerns raised by the public. These prescriptions represent a wide range of alternative methods for managing the Forest.

The "Fish Habitat and Water Quality" and "Stream and Lake Protection" Management prescriptions relate to riparian management. Both are designed to conform to the requirements of the National Forest Management Act (NFMA), with "Fish Habitat and Water Quality" meeting the NFMA regulations of no management practices which seriously and adversely affect water conditions or fish habitat and "Stream and Lake Protection" which, in addition, maintains or enhances the biological productivity of aquatic systems and riparian dependent species.

A riparian prescription would apply wherever development activities could be more impacting than in the riparian prescription. For instance, along all perennial streams and riparian areas which could normally be allocated to a timber production prescription, instead a riparian prescription would apply. However, where management is normally less impacting than that which could occur in a riparian prescription, for instance in old growth management, then a riparian prescription would not apply. In the latter case, forest-wide direction and standards/guidelines would apply in managing the riparian area.

In addition to these two prescriptions, two other riparian schemes need analysis. A number of prescriptions include essentially no resource development, such as the old growth, beach fringe, wild river, and primitive recreation prescriptions. Since no, or negligible disturbance should occur to reduce inputs of instream large woody debris, these prescriptions result in no change to smolt habitat capability of a stream. The other scheme is clearcut to the streambank for every channel type. This is not an implementable prescription as it is not considered to meet the requirements of the National Forest Management Act, but is considered for benchmark analysis. In benchmark analysis, the effect on timber harvest and other resources (such as fish) with maximum timber production is measured. Benchmarks are also used to measure the effects of maximizing outputs of other resources, besides timber.

Other riparian prescriptions could easily be designed, and would be evaluated for change in woody debris source

potential much the same as will be shown for the three prescriptions with riparian harvest described above.

Clearcut is the simplest of the management prescriptions to model. In this prescription, it is assumed that all the woody debris sources (key pieces of greater than or equal to 24 inch or 36 inch diameter, depending on channel type) are harvested. Large woody debris in the stream is allowed to remain and decay naturally.

The "Fish Habitat and Water Quality" Management Prescription, which would result in some reductions in fish populations, typically allows harvest within a variable distance of the stream. For instance, for some channel types, no harvest is allowed 0-60 feet from the stream, and then single tree selection is allowed in the balance of the riparian area (typically 60-100 feet).

Murphy et al.[11] show the distance from which woody debris enters stream systems. Using this information, and the prescription data, estimates were made of the woody debris depletion for each of the prescriptions, and for each of the stream classes, if applicable. Single tree selection was defined as one entry, harvesting 10 percent of the tree size classes found in the riparian harvest area.

Channel Type Capability Calculations

For each species (Dolly Varden and coho salmon) and for each stream class (only in the case of Dolly Varden which can be either resident or anadromous fish), a separate model (spreadsheet) was developed. The model was run for each of the channel types, by decade, for 210 years following harvest. The 210 year period incorporates the maximum predicted reduction in habitat capability following harvest.

Forest Wide Capability Calculations

The models predict a number of habitat capability statistics, including habitat capability for: 1) 1954, prior to any large scale industrial logging on the Tongass National Forest, with the Forest almost entirely old growth; 2) 1979, at the beginning of the implementation of the current Tongass Land Management Plan; and 3) 1988, which is considered the current situation. Other scenarios the

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[11]Murphy, Michael L., J. Mitchel Lorenz, Jonathan Heifetz, John F. Thedinga, K V Koski, and Scott W. Johnson. 1987. The relationship between stream classification, fish, and habitat in Southeast Alaska. WIldlife and Fisheries Habitat Management Notes, Tongass National Forest R10-MB-10. U.S. Department of Agriculture, Forest Service. 63p.

models can predict include how the habitat capability would change if there were no additional harvest adjacent to streams. The following is a description of the models that have been run, including the rationale for the model and some of the relevant assumptions.

Model BASE88: Coho and Dolly Varden capability under current management.

Rationale: To determine what have been the affects of past management activities, and what would be anticipated changes resulting from those changes into the future. These models would also show the affects of implementing a 100 foot buffer along all significant salmon streams.

Assumptions: No additional timber harvest affecting the riparian area; no additional fishway construction to make additional stream length accessible. This model includes adjustments for fish passage built between 1954 and 1988.

Model BASE54: Coho and Dolly Varden capability under current management, and as if no fishways were built between 1954 and the present.

Rationale: To determine what have been the affects of past management activities, and what would be anticipated changes resulting from those changes into the future. These models would also show the affects of implementing a 100 foot buffer along all significant salmon streams. This model shows the reductions that have occurred due to timber harvest, with no increases shown for fishway construction. Subtracting the results of this model (BASE54) from model BASE88 shows the estimated capability resulting from fishway construction.

Assumptions: No additional timber harvest affecting the riparian area; no additional fishway construction to make additional stream length accessible. This model does not include adjustments for fish passage built between 1954 and 1988.

Model 54XCC: Coho and Dolly Varden capability under the scenario that all suitable riparian trees would have been harvested in 1954.

Rationale: To determine the maximum affect of timber harvest (clearcut) on stream habitat capability.

Assumptions: All riparian timber affecting the riparian area clearcut harvested in 1954. This model includes no adjustment for fish passage built between 1954 and 1988.

Model 88XCC:	Coho and Dolly Varden capability under the scenario that all suitable riparian trees would have been harvested in 1988.
Rationale:	To determine the maximum affect of timber harvest (clearcut) on current stream habitat capability.
Assumptions:	All riparian timber affecting the riparian area clearcut harvested in 1988. This model includes habitat enhancements and reductions that have occurred between 1954 and 1988.
Model 54X13:	Coho and Dolly Varden capability under the scenario that all suitable riparian areas would have been harvested using the "Fish Habitat and Water Quality" Management Prescription in 1954.
Rationale:	To determine the maximum affect of implementation of the "Fish Habitat and Water Quality" Management Prescription on stream habitat capability.
Assumptions:	All riparian areas harvested using the Standards and Guidelines of the "Fish Habitat and Water Quality" Management Prescription in 1954. This model includes no adjustment for fish passage built between 1954 and 1988.
Model 88X13:	Coho and Dolly Varden capability under the scenario that all suitable riparian trees would have been harvested using the "Fish Habitat and Water Quality" Management Prescription in 1988.
Rationale:	To determine the maximum affect of implementation of the "Fish Habitat and Water Quality" Management Prescription on current stream habitat capability.
Assumptions:	All riparian areas harvested using the Standards and Guidelines of the "Fish Habitat and Water Quality" Management Prescription in 1988. This model includes habitat enhancements and reductions that have occurred between 1954 and 1988.
Model 54X14:	Coho and Dolly Varden capability under the scenario that all suitable riparian areas would have been harvested using the "Stream and Lake Protection" Management Prescription in 1954.
Rationale:	To determine the maximum affect of implementation of Management Prescription 14-G on stream habitat capability.
Assumptions:	All riparian areas harvested using the Standards and Guidelines of the "Stream and Lake Protection" Management Prescription in

1954. This model includes no adjustment for fish passage built between 1954 and 1988.

Model 88X14: Coho and Dolly Varden capability under the scenario that all suitable riparian trees would have been harvested using the "Stream and Lake Preotection" Management Prescription in 1988.

Rationale: To determine the maximum affect of implementation of the "Stream and Lake Protection" Management Prescription on current stream habitat capability.

Assumptions: All riparian areas harvested using the Standards and Guidelines of the "Stream and Lake Protection" Management Prescription in 1988. This model includes habitat enhancements and reductions that have occurred between 1954 and 1988.

Model values for streams are calculated based on four items -- length of each channel type, capability by channel type, amount of each channel type available (i.e. without downstream barriers to anadromous fish), and vegetation condition of the riparian area. The source of each of the data items is as follows:

*channel type lengths:
Tongass-wide channel typing inventory. For wilderness areas without channel typing inventories, proration estimates from areas with channel typing data are made. See below. Tables used for channel type lengths included channel-type and stream class.

*capability by channel type:
The models described on the preceding pages of this paper.

*amount of channel type available:
Biologists on each of the Tongass Administrative Areas made estimates of amount of stream class I habitat available to coho salmon in 1954, 1979 and 1988.

*vegetative condition:
Estimates were made of riparian vegetative condition using the Geographical Information System (GIS) used by the Forest Revision Planning Team. To do this, 100 foot buffers (150 foot buffers for some of the larger floodplain channels) were computer generated along every stream in the channel type database. The area encompassed by these buffers was overlain with the timber type maps stored in the GIS. A report was produced showing, by VCU, the acres of the buffers in each timber size class. The following interpretations of size class in the timber type data were used:

```
          Logged = average 5 year old stands
    Size Class 1 = average 15 year old stands
    Size Class 2 = average 45 year old stands
Size Class 3 & 4 = considered to be old growth
```

In some cases, riparian areas that have never been harvested were inventoried as size class logged, 1 or 2; this occurs in areas with early successional vegetation, such as in Yakutat and on mainland glaciated areas. These locations were reinterpreted to be old-growth in the capability determinations.

Effects of past management activities were modeled by assuming: 1) all riparian timber harvest prior to 1979 generally employed a clearcut prescription; and, 2) all riparian harvest between 1979 and 1988 averaged a Prescription Fish Habitat and Water Quality harvest. Therefore, any riparian buffer currently in Size Class 1 and 2 used the clearcut habitat capability tables, and those in the "Logged" size class used the Prescription Fish Habitat and Water Quality habitat capability tables.

Geographical Reporting Areas

The basic geographic area for which habitat capability has been calculated is the VCU (Value Comparison Unit), although capability could be calculated for individual streams, if desired. Value comparison units have been aggregated into larger areas, called geozones. Geozones have been aggregated to Administrative Area of the Tongass (Ketchikan, Stikine and Chatham Areas), and Administrative Areas have been aggregated to a value for the entire Forest.

```
VCU  (sum of individual channel types and streams)
   \
    \
     Geozone  (sum of VCUs)
           \
            \
             District   (sum of Districts)
                   \
                    \
                     Admin. Area  (sum of Districts)
                              \
                               \
                                Tongass National Forest
```

Tables with VCU, geozone and Administrative Area Reports are too detailed to place in this here, however they are available in the planning records.

Lakes

Rearing habitat capability resulting from lakes for both Dolly Varden and coho is held as a constant in this model. The rationale for this is that lake production is normally not altered by upland management activities. In Southeast Alaska, only two lake systems are thought to have been altered by timber management activities; both are located on private lands.

The following assumptions were used about lake production of Dolly Varden and coho. The assumptions were based on communications with various agency biologists, including from the National Marine Fisheries Service, the Forest Service, AK Dept. of Fish and Game, and Northern Southern Regional Aquaculture Association.

Coho Production	30% of acreage under 500 feet elevation available 75 smolts/acre no lakes available at over 500 feet elevation
Dolly Varden Prod.	60% of acreage under 500 feet elevation available 160 fish/acre 20% of acreage 500-200 feet elevation available 80 fish/acre

Minor modifications of these assumptions result in substantial differences in the overall capability of the Forest to produce coho and Dolly Varden. However these productions values are constant across all viable management alternatives, and the accuracy of these estimates are not critical to the future management of the Forest.

Pink Salmon Model

Pink salmon are typical of the five species of Pacific salmon in that their life cycle spans both a freshwater and saltwater phase. In developing a model that predicts numbers of pink salmon, a look should be taken at all phases of a salmon's life history, including those periods that are the most limiting.

It is well known that pink salmon adult returns vary greatly from year to year, although in most cases this does not appear to be correlated to on-land activities. Some of the factors that may affect survival are: metereological effects on land (such as very cold winters in which the stream gravels freeze to the depth of the eggs); meteorological effects in the ocean (such as particularly warm or cold ocean temperatures or wayward currents affecting food availability); and, off-shore fish harvests, including predation.

The Forest Service, as a land management agency, is primarily interested in the capability of the land and its associated waters to predict numbers of fish. Because of the highly variable nature of adult pink salmon production, to best represent production of the streams and of the land, it is best to look at smolt habitat capability, or the potential of the streams to produce smolts assuming full escapement, or stocking of adult fish.

In the phase of the pink salmon life history where the fish are dependent on the land, pink salmon are thought to be most often limited by the quality and quantity of spawning gravels present in a system. This differs from many of the other species of salmon (such as chinook, coho and sockeye) which require periods of freshwater rearing. With these other species it is generally found that the the freshwater rearing phase of their life is more limiting than the quantity of spawning habitat available. Because pink samon are most often limited by spawning availability (as would be chum salmon, also a non-freshwater rearing salmon species), it is this phase of their life for which this model is developed.

Assumptions: 1 female/sq.meter (or 2 fish per sq. meter) is preferred spawnign density on ASA.

<u>The Capability Model</u>

The pink salmon production from a stream is correlated to the area of available spawning gravels, and is limited to that portion effectively used by pink salmon and not other species of spawning fish. Total spawning area is a function of accessible stream length, available spawning area (ASA) within each stream reach, portion of the ASA within a stream reach that is normally accessible by pink salmon, and portion of the ASA that is used by pink salmon (rather than another species of salmon).

Stream reaches are defined for the Tongass National Forest by channel types: an inventory and classification of similar stream reaches. For each channel type, the average width of the stream is known, as is the average amount of ASA within that stream reach.

Each unit area of available spawning area has a smolt capability. This smolt capability is expected to vary somewhat by: year, channel type, gravel quality, location within the watershed, watershed disturbance, meterological effects including effects represented as anchor ice and stream gravel freezing, stream temperature and probably other variables. We have assumed for this model that channel type is the predominant factor controlling the smolt capability per unit area of spawning gravel.

Knowing by channel type, ASA per foot of stream length, the portion of the ASA availalbe in a channel type to pink salmon, the portion used by pink salmon rather than other spawning salmon species, the smolt capability per unit of stream area and whether a given channel reach will be accessible to pink salmon due to downstream barriers (including barriers represented by channel types) a model for stream habitat capability can be identified:

Total Smolt Habitat Capability =

Sum by Each Stream Reach (channel type) Length
X ASA/ft
X Portion ASA available
X Portion ASA used only by pink salmon
X Number of smolts/ASA

It is assumed in this model that distance from salt water is NOT a factor for spawning pink salmon. Pink salmon usually will migrate at least 40 miles upstream and have been known to migrate at 435 miles upstream ("Freshwater Habitat Model for Pink Salmon - Oncorhynchus gorbusch," Alaska Department of Fish and Game, Habitat Protection Section, Resource Assessment Branch, April, 1981). All (or essentially all) of the streams on the Tongass National Forest are considerably shorter than 40 miles in length. Therefore, although pink salmon may be adapted to Southeast Alaska's coastal streams, it still seems reasonable to assume that all accessible habitat on streams is capable of producing pink salmon.

Assume that a barrier that is listed as a partial barrier is a total barrier to pink salmon. Since pink salmon are the least capable of all the salmon to pass over barriers, very few of the pink salmon, even in a high escapement year, would be expected to pass the partial barrier. Although there may be the occasional water condition, and adult that is strong enough to pass, the numbers of these fish is probably inconsequential.

The following shows the breakdown of use by pink salmon for different stream channel types.

Channel Type	~~ASA(m^2)~~ ft	Will Pink Salmon Pass Through?	What % of ASA is Used?	Comments
all A's		no	0	
B-1		yes	100	
B-2		no	0	B-2 draining directly into salt water
B-2		no	50	B-2 tributary to C channels; only half the ASA is used to account for portions of channels over 3% gradient
B-3		yes	100	
B-4		no	0	
B-5		no	20	lower end of B-5 is generally available
B-6		no	0	
B-7		no	0	
all C's		yes	100	
D-1		no	0	
D-2		no	0	
D-3		no	0	
D-4		yes	0	
D-5		yes	0	
D-6		no	0	have some ASA in very unusual circumstances
D-7		no	0	
all E's		yes	100	
L-1		yes	0	
L-2		yes	0	
L-3		no	0	
L-4		yes	0	
L-5		yes	0	

The Department of Fish and Game has had a program of doing egg/fry pumping since at least 1977. The purpose of the egg pumping was to help enable the Department to make estimates of over-winter survival, and hence returns to the fishery from the measured brood stock. In southern Southeast Alaska this program was discontinued because with the high variability the Department was unable to accurately predict fish returns. In northern Southeast Alaska, the egg/fry pumping is still being continued.

Use of the egg/fry pumping data can help determine the egg to smolt survival in Southeast's streams. Assuming that optimum escapement for pink salmon is 1 female per square meter of spawning gravel (ASA), and that the data represents optimum spawning, by breaking down the egg/fry pumping data by channel type a different survival percentage can be looked at for the different channel types. Only northern Southeast data should be used for this analysis, as the

Department acknowledges the inconsistencies with the southern Southeast data. In any case, the egg/fry pumping data should help fine-tune this model.

APPENDIX C

APPENDIX C

ROADLESS AREAS

Appendix C describes the 106 Roadless Areas evaluated in the Tongass Land Management Plan revision process. Areas are included in the following order:

Unit No	*Area Name*	*National Forest Acres*
TSA 201	FANSHAW	48,869
TSA 202	SPIRES	536,653
TSA 203	THOMAS	4,517
TSA 204	MADAN	68,998
TSA 205	AARON	78,884
TSA 206	CONE	128,574
TSA 207	HARDING	177,598
TSA 208	BRADFIELD	212,872
TSA 209	ANAN	37,933
TSA 210	FROSTY	41,395
TSA 211	NORTH KUPREANOF	116,666
TSA 212	MISSIONARY	14,005
TSA 213	FIVE MILE	19,438
TSA 214	SOUTH KUPREANOF	209,957
TSA 215	CASTLE	49,360
TSA 216	LINDENBERG	22,797
TSA 217	GREEN ROCKS	10,380
TSA 218	WOEWODSKI	10,376
TSA 219	NORTH MITKOF	5,876
TSA 220	EAST MITKOF	10,250
TSA 223	MANZANITA	7,850
TSA 224	CRYSTAL	19,293
TSA 225	KADIN	1,623
TSA 226	GREYS	361
TSA 227	NORTH WRANGELL	11,624
TSA 229	SOUTH WRANGELL	71,173
TSA 231	WORONKOFSKI	9,773
TSA 232	NORTH ETOLIN	46,887
TSA 233	MOSMAN	57,974
TSA 234	SOUTH ETOLIN	113,031
TSA 235	WEST ZAREMBO	6,945
TSA 236	EAST ZAREMBO	8,990

Unit No	Area Name	National Forest Acres
TSA 237	SOUTH ZAREMBO	32,288
TSA 238	KASHEVAROF ISLANDS	5,725
TSA 239	KEKU	12,126
TSA 240	SECURITY	41,105
TSA 241	NORTH KUIU	9,741
TSA 242	CAMDEN	54,730
TSA 243	ROCKY PASS	78,976
TSA 244	BAY OF PILLARS	28,570
TSA 245	EAST KUIU	46,271
TSA 246	SOUTH KUIU	124,065
TCA 301	JUNEAU-SKAGWAY ICE FIELD	1,209,199
TCA 302	TAKU-SNETTISHAM	736,112
TCA 303	SULLIVAN	66,657
TCA 304	CHILKAT-WEST LYNN CANAL	207,277
TCA 305	JUNEAU URBAN	104,970
TCA 306	MANSFIELD PENINSULA	52,994
TCA 307	GREENS CREEK	48,078
TCA 308	WINDHAM-PORT HOUGHTON	240,296
TCA 309	JUNEAU ISLANDS	7,051
TCA 310	DOUGLAS ISLAND	27,390
TCA 311	CHICHAGOF	637,238
TCA 312	TRAP BAY	22,008
TCA 314	POINT CRAVEN	11,837
TCA 317	POINT AUGUSTA	19,479
TCA 318	WHITESTONE	6,100
TCA 319	PAVLOF-EAST POINT	10,900
TCA 321	TENAKEE RIDGE	24,262
TCA 323	GAME CREEK	67,046
TCA 324	PLEASANT ISLAND	12,239
TCA 325	FRESHWATER BAY	63,206
TCA 326	NORTH KRUZOF	31,170
TCA 327	MIDDLE KRUZOF	15,540
TCA 328	HOONAH SOUND	97,257
TCA 329	SOUTH KRUZOF	56,701
TCA 330	NORTH BARANOF	341,417
TCA 331	SITKA URBAN	120,536
TCA 332	SITKA SOUND	19,475

Unit No	Area Name	National Forest Acres
TCA 333	REDOUBT	75,732
TCA 334	POINT ALEXANDER	126,120
TCA 338	BRABAZON ADDITION	500,374
TCA 339	YAKUTAT FORELANDS	305,871
TCA 341	UPPER SITUK	61,722
TKA 501	DALL ISLAND	108,260
TKA 502	SUEMEZ ISLAND	36,327
TKA 503	OUTER ISLANDS	102,881
TKA 504	SUKKWAN	46,145
TKA 505	SODA BAY	76,596
TKA 507	EUDORA	233,933
TKA 508	CHRISTOVAL	7,750
TKA 509	KOGISH	76,175
TKA 510	KARTA	121,440
TKA 511	THORNE RIVER	112,460
TKA 512	RATZ	8,349
TKA 513	SWEETWATER	11,104
TKA 514	SARKAR	73,565
TKA 515	KOSCIUSKO	70,216
TKA 516	CALDER	12,687
TKA 517	EL CAPITAN	43,604
TKA 518	SALMON BAY	36,426
TKA 519	POLK	149,205
TKA 520	KASAAN	8,536
TKA 521	DUKE	46,785
TKA 522	GRAVINA	38,952
TKA 523	SOUTH REVILLA	71,358
TKA 524	REVILLA	138,393
TKA 525	BEHM ISLANDS	2,042
TKA 526	NORTH REVILLA	163,771
TKA 527	NEETS	6,315
TKA 528	CLEVELAND	193,473
TKA 529	NORTH CLEVELAND	114,158
TKA 530	HYDER	128,585
TKA 531	NUTKWA	59,318
TKA 532	FAKE PASS	798
TKA 577	QUARTZ	149,107

ROADLESS AREAS ANALYSIS

INTRODUCTION

The purpose of Appendix C - Roadless Areas is to present a more detailed description and effects analysis of the areas of the Tongass National Forest that are in an unroaded and essentially undeveloped condition. Appendix C describes each area's attributes and resource potentials, evaluates the area's capability and availability for management as Wilderness or allocation to other roadless management prescriptions, and specifically indicates how the future potential for each area to be considered for inclusion in the National Wilderness System would be affected by the Alternatives proposed in this Draft EIS. Each roadless area is identified by a name and a number, e.g. "312 Trap Bay". The roadless areas are shown on the map called "Roadless Areas" in the map packet, and are identified on the map by the area's number.

Each roadless area description is divided into the following sections:

DESCRIPTION: The history, location and access, physiographic and biologic features, current resource uses, and appearance, surroundings, and attractions are described

WILDERNESS POTENTIAL: The presence or absence of wilderness characteristics, potential for solitude, and manageability and special features are identified.

RESOURCES: The presence or absence of opportunities for resource uses, both extractive and non-extractive, are described. The relationship of each area to nearby areas and uses, and public interest in the potential management opportunities, are presented.

A table displaying the approximate acreages for each alternative under four prescription groupings is presented.

1. Acres shows under the heading "Wilderness" are those acres included in the H.R. 987 proposed Wilderness.

2. The "natural setting" prescription group includes prescriptions that generally do not permit scheduled timber harvest. Prescriptions for Beach Fringe, Stream and Lake Riparian management, and eagle nest buffers are included in this group but are not shown on the "Roadless Areas" map, but are shown on the table in the "natural setting" column.

3. The "moderate development" prescription group allows developments, timber harvest and road construction, but under constraints that maintain visual quality and recreation opportunities.

4. The "intensive development" prescription group emphasizes timber production using economical harvest practices.

In both the "moderate development" and "intensive development" prescription groups, the level of permitted and likely development would eliminate the area from future consideration from inclusion in the National Wilderness System.

CONSEQUENCES: Following the table, the consequences of implementing each alternative within each roadless area are discussed, concentrating on the effects each would have on the naturalness, integrity and potential for future consideration of the area for inclusion in the National Wilderness System.

(201) Fanshaw
Gross acres: 48,889
National Forest acres: 48,869

Description

The Fanshaw roadless area is located on the mainland at Cape Fanshaw and extends south to the North Arm of Farragaut Bay. The shoreline along Frederick Sound is exposed and often difficult to access. The area is characterized by four separate peaks and ridges with low-lying valleys in-between. The many bays provide good anchorages. The area was probably inhabited by Tlingit in prehistoric times; there was a fox farm in Fanshaw Bay during the 1930-40's. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include mountain goats, black bears, deer, and an occasional brown bear and moose; waterfowl use the limited grass flats at the head of the North Arm. There are seven ADF&G numbered salmon producing streams within the area. Attractions to the area include the 540-acre Research Natural Area near Fanshaw Bay established for protection and study of a stand of Alaska-cedar, which is not particularly unique. Cape Fanshaw is also known to be a good site for collecting the wild Sitka rose. There are no cabins and the area does not receive much use, except for anchorages in some of the bays.

Wilderness Potential

The area is essentially unmodified except for some evidence of an old fox farm. There is a high opportunity for solitude within the area. Low-flying airplanes are infrequent and boat traffic is far enough offshore not to cause any distraction. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities. There are no developed recreation facilities in the area, and the presence of bears also presents a degree of challenge and a need for woods skills and experience.

Resources

The area contains 20,831 acres of tentatively suitable forest land. As there are no suitable sites for log transfer facilities in the area, the potential for managing timber depends on the development of a road sysyem in the adjoining roadless area to the north. Development is not likely in the near future. There is potential for additional outfitter/guide permits, trails, and cabins or shelters. Both fish and wildlife resource improvement projects are possible. The State has selected 700 acres within this area. There has been little interest on the part of any interest groups to retain the roadless character of this area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	12,710	19,250	16,890	0
B	17,050	14,930	16,890	0
C	45,370	2,480	1,020	0
D	31,340	1,930	15,600	0
E	45,353	2,480	1,020	0
F	45,370	2,480	1,020	0
G	45,370	2,480	1,020	0

Consequences

In Alternatives A, B, and D a small area around Jamestown Peak and the north arm of Farragut Bay are managed for primitive and semi-primitive recreation, retaining Wilderness potential. The remainder of the area is managed for a mix of moderate to intensive development, precluding Wilderness potential. In Altenatives C, E, F, and G, the entire area is managed for intensive development, precluding Wilderness potential.

(202) Spires

Gross acres: 537,376
National Forest acres: 536,653

Description

The Spires roadless area is located on the mainland, from the Port Houghton drainage and Tracy Arm-Fords Terror Wilderness on the north to the Stikine-LeConte Wilderness on the south. The shoreline along Frederick Sound on the southwest is exposed and often difficult to access. The area is characterized as highly complex terrain dominated by rugged mountains, with deep valleys and numerous glaciers in- between. The Farragut and Thomas Bay areas were inhabited by the Tlingit in prehistoric times. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include mountain goat, black bear, deer, and an occasional brown bear and a moderate population of moose. Waterfowl use the extensive grassflats at the head of Farragut Bay and smaller areas around Thomas Bay. Thirteen ADF&G numbered salmon producing streams are present. Thomas and Farragut Bays are frequently used by small pleasure and commercial fishing boats. There are 4 recreation cabins and 3 improved trails. Moose hunting is popular during the fall, and there is some subsistence activity, primarily from Petersburg residents.

Wilderness Potential

The area is essentially unmodified, except for the Muddy and lower Patterson River valleys where logging has occurred. There is a high opportunity for solitude within the area. Low flying airplanes may briefly disrupt visitors, but passing boats are generally far enough offshore so as not to cause any distraction. The area provides primarily primitive, and semi-primitive motorized and non-motorized opportunity. The presence of bears also presents a degree of challenge and a need for woods skills and experience.

Resources

The area contains 33,551 acres of tentatively suitable forest land. The potential for managing timber in this area is closely linked to the existing road system near Thomas Bay, or development of additional log transfer facilities in Thomas and Farragut Bays. Recreation potential includes additional outfitter/guide permits, trails, cabins, or shelters. There are several fish and wildlife resource enhancement projects planned for the area. The Scenery Lake and Swan Lake drainages have been identified by the Federal Power Commission as potential hydropower generation sites and are withdrawn from other management considerations. There are two existing special use permits in the area. Mineral development potential is not high. Local Petersburg residents have a high degree of interest in how this area is managed. There was a strong protest when the State considered subdividing and selling land in Thomas Bay.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	440	29,000	840	0
B	34,870	19,150	484,670	0
C	49,940	28,560	460,190	0
D	94,450	4,320	439,920	0
E	49,940	28,560	459,790	0
F	49,940	28,560	460,200	0
G	49,940	28,560	440,200	0

Consequences

In Alternative A, the majority of the area is managed for primitive recreation and old-growth, retaining its Wilderness potential, except for areas on the north and sides of Thomas Bay which are managed for moderate development. In Alternatives B, C, E, F, and G the majority of the area is managed for primitive recreation and old-growth, retaining Wilderness potential, with more intensive development than Alternative A including the Muddy River drainage. In Alternative D, only the high elevation area is managed for semi-primitive recreation, and while it retains potential as Wilderness, it is greatly reduced in ecoysystem diversity. The area managed intensively for timber production in this alternative is expanded to include Farragut Bay which loses its potential for Wilderness.

(203) Thomas

Gross acres: 4,697
National Forest acres: 4,517

Description

The Thomas roadless area is located on the mainland between Thomas Bay and Frederick Sound on the Point Agassiz Peninsula. Cutting units generally define the eastern and southern boundaries. Anchorage is available in Thomas Bay, but the shoreline along Frederick Sound is exposed and often difficult to access. The area is generally characterized by gently-rolling terrain with little relief. Thomas Bay was within the territory of the Talquedi clan of the Stikine Tlingit and there are several sites and petroglyphs left as evidence of their use. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include moose, brown bear, and Sitka black-tailed deer. There are no developed recreation facilities in the area. Some subsistence activities occur in the area, primarily from residents of Petersburg. Thomas Bay is also a popular recreation destination for residents of Petersburg. Relatively heavy boat traffic can occur at times.

Wilderness Potential

The area is unmodified, however adjacent management and recreational activities make it likely that the natural integrity has been impacted to some degree. There is a moderate opportunity for solitude within the area. Low flying airplanes may disrupt visitors for brief periods, but boats bypassing the area are generally offshore far enough so as not to cause any distraction. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities. The presence of bears presents a degree of challenge and a need for woods skills and experience.

Resources

The area contains 1,099 acres of tentatively suitable forest land. There is potential for managing timber as log transfer facilities are connected to an existing road system adjacent to the southern end of this area. There is recreation potential for outfitter/guide permits, trails, cabins or shelters. Moose habitat improvement projects are planned in this area. There are no inventoried areas with high mineral development potential. Local Petersburg residents have a high degree of interest in how this area is managed. There was a strong protest when the State considered subdividing and selling land in Thomas Bay.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	100	20	4,400	0
B	300	20	4,200	0
C	4,400	40	80	0
D	340	20	4,160	0
E	4,400	40	80	0
F	4,400	40	80	0
G	4,400	40	80	0

Consequences

In Alternatives A, B, and D, the majority of the area is managed for semi-primitive recreation and retains marginal potential for Wilderness. In Alternatives C, E, F, and G, the area is mainly managed for intensive timber development, precluding Wilderness potential.

(204) Madan

Gross acres: 72,958
National Forest acres: 68,998

Description

The Madan roadless area is located on the mainland and is bounded on the south by the Stikine-LeConte Wilderness; on the west by the Eastern Passage, on the south by Blake Channel; and on the east by the Aaron Creek divide. There are accessible shorelines for landing small craft and floatplanes when weather conditions are favorable. The area is generally characterized as highly-complex terrain dominated by rugged mountains with deep, broad valleys in-between. Dominant waterforms include a relatively small glacier which occupies the highest mountains, Virginia Lake, and the waterfall on Mill Creek. The area was inhabited by the Tlingit in prehistoric times. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include mountain goats, black bear, deer and an occasional brown bear or moose. Even though there are seven ADF&G numbered fish streams in the area, salmon production is generally low. Some subsistence fishing occurs on Mill Creek for sockeye salmon. There are two recreation cabins and one short maintained trail in the area. Attractions include Virginia Lake and the opportunity to observe and study petroglyphs on the beach near Mill Creek.

Wilderness Potential

The majority of this area is natural appearing and unmodified, except for cabin sites, the trail, and a fish pass at the mouth of Mill Creek. There is moderate to high opportunity for solitude within the area. Low-flying aircraft may disrupt visitors for brief periods, but boats bypassing are generally far enough offshore so as not to cause any distraction. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities.

Resources

The area contains 22,366 acres of tentatively suitable forest land. A preliminary timber analysis showed that timber values, overall, were not sufficient to warrant further investment at this time. Recreation potential includes additional outfitter/guide permits, trails, cabins, or shelters. Virginia Lake recreation cabin is being considered for conversion to barrier-free accessibility. Both fish and wildlife resource enhancement projects have potential. The Virginia Lake drainage has been identified as a potential hydropower generation site and is withdrawn from competing management. Native land selections include a four-acre Sealaska historical site at Green Point. Part of the 9,910-acre Zimovia Strait/Eastern Passage State selection is in this area. There are numerous mining claims and one group has been patented, but development potential is unknown. Wrangell residents have a high degree of interest in maintaining the integrity of the area around Virginia Lake, but many would like to see development in other parts of the area, including a road link between Wrangell and the Canadian highway system.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	14,520	18,780	35,690	0
B	14,520	25,860	28,610	0
C	0	66,700	2,300	0
D	55,650	2,960	10,390	0
E	0	66,700	2,300	0
F	0	66,700	2,300	0
G	0	66,700	2,300	0

Consequences

In Alternative A, the Virginia Lake drainage adjacent to the Stikine-LeConte Wilderness is managed for old-growth and primitive recreation, retaining Wilderness potential. The remainder of the area is managed for a mix of development uses, and loses Wilderness potential. Alternative B is similar to Alternative A, but there are a few more intrusions of moderate development which cause it to have low potential as Wilderness. Alternative C, E, F, and G are managed almost entirely for moderate development, not retaining any Wilderness potential. Alternative D is managed almost entirely for intensive timber development, not retaining any Wilderness potential.

(205) Aaron
Gross acres: 78,884
National Forest acres: 78,884

Description

The Aaron roadless area is located on the mainland and is bounded on the north by the Stikine-LeConte Wilderness and on the west, south and east by other roadless areas. There are 10 miles of shoreline at Blake Channel, including Berg Bay which is good anchorage for small boats. The area is dominated by rugged mountains, with deep, broad valleys in-between with several sizable streams which ultimately feed into the main channel of Aaron Creek. Small glaciers occupy the highest mountains, Aaron Creek, and numerous small cirque lakes. The area was used by the Tlingit in prehistoric times. Recent use includes extensive prospecting, and log raft storage on the grassflats at Aaron Creek. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include mountain goats, black bears, deer, wolves, and an occasional brown bear or moose. Aaron Creek produces chum, coho, and king salmon. Some subsistence activities occur in the area. There is a popular cabin at Berg Bay and a trail at Aaron Creek. Overall, the area provides spectacular scenery.

Wilderness Potential

The area is essentially unmodified, except for minor impacts from mining and the cabin site. There is a high opportunity for solitude within the area. Low-flying aircraft follow Blake Channel and boats frequent Berg Bay, but generally a person camped inland would not see others. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities.

Resources

The area contains 7,219 acres of tentatively suitable forest land. Potential for managing timber is closely linked to the development of an access road up the main river valley and the development of a log transfer facility. There is potential for additional trails and shelters located at high elevations. Wildlife enhancement opportunities include slashing portions of the older, decadent willow to promote new growth for moose, and improvement of habitat for waterfowl. There are numerous mining claims in the area, but potential for development is unknown. The valley is a potential road route to link the community of Wrangell to the Canadian highway system. The log storage area at the mouth of Aaron Creek is under special use permit with the State. Local Wrangell residents have a moderate degree of interest in maintaining the integrity of the area. Some would like to see development, while others support maintaining the roadless character of the area for wildlife and scenic values.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	78,880	0
B	0	1,840	78,880	0
C	44,030	900	33,960	0
D	23,350	200	55,340	0
E	44,030	900	33,960	0
F	44,030	900	33,960	0
G	44,030	900	33,960	0

Consequences

In Alternative A, the area is managed for old-growth and primitive recreation, and retains it Wilderness potential. Alternative B is managed for primitive recreation and retains it Wilderness potential. In Alternatives C, E, F, and G, the Aarons Creek drainage is managed intensively for timber and loses its potential for Wilderness. Only the Oerns Creek drainage retains any potential for Wilderness. In Alternative D, the upper Aarons Creek and Oerns Creek drainges are managed for primitive recreation, and retain greater potential for Wilderness than Alternatives C, E, F, and G.

(206) Cone

Gross acres: 128,574
National Forest acres: 128,574

Description

The Cone roadless area is located on the mainland and is landlocked. It is bounded on the north by the Canadian border, on the west by the Stikine-LeConte Wilderness and on the rest by roadless areas. The area is dominated by rugged mountains with deep, narrow valleys in-between containing several sizable streams which ultimately feed into the Stikine and Iskut Rivers. Dominant water-forms include the high velocity streams and small glaciers which occupy the highest mountains. Access is by foot or helicopter. Since the area drains entirely into Canada and is accessible only with great difficulty from the Alaskan side, there has been little use of the area in the past. Alpine vegetation dominates above an elevation of 2,500 feet. Below that elevation, the steep mountain sides are heavily marked with snowslide and landslide paths which are typically covered with grass, alders and willows. Wildlife include mountain goats, black and brown bears, and moose. There are no facilities of any kind, and the area gets little use. The attractions to the area include its natural features, remoteness, and solitude.

Wilderness Potential

The area is unmodified. Activities on the Canadian side of the border are most likely to influence this area, such as the possibility of mining or a dam on the Iskut River. There is high opportunity for solitude within the area, with only an occasional low-flying aircraft to disturb one's sense of solitude. The area provides primarily primitive recreation opportunities. The difficult access and presence of bears present a high degree of physical challenge and a need for woods skills and experience.

Resources

The area contains 4,229 acres of tentatively suitable forest land. There is no potential for managing timber in this area without road access. The nature of the steep slopes and scattered timber make it doubtful that timber harvest would be economical even if a road were financed by other sources. Recreation potential for increased use or facility development is low until access is improved. There are several invalid mining claims in the area and potential for development of new claims is unknown. A 69 KV powerline has been authorized for construction and the portion that traverses the headwaters of the Craig River would be in this area. Two possible routes between saltwater and the Canadian highway system include portions of this area. Local Wrangell residents have a high degree of interest in this road system. Presently, there is virtually no local use of the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	128,570	0
B	0	0	128,570	0
C	0	0	128,570	0
D	0	0	128,570	0
E	0	0	128,570	0
F	0	0	128,570	0
G	0	0	128,570	0

Consequences

In all alternatives, the area is managed for primitive or semi-primitive recreation, and fully retains Wilderness potential.

(207) Harding

Gross acres: 177,598
National Forest acres: 177,598

Description

The Harding roadless area is located on the mainland and is bounded on the west by Blake Channel, on the southeast by Misty Fiords National Monument, and by other roadless areas on all other sides. The Bradfield Canal bisects the area. The area is generally dominated by rugged mountains, with deep, narrow valleys in-between containing several sizable streams which ultimately feed into Blake Channel or Bradfield Canal. Dominant waterforms include numerous streams, several lakes covering a total area of about 1,000 acres, and relatively small glaciers on the highest mountains. The area was used by the Tlingit in prehistoric and historic times. Vegetation is typical southeast Alaska temperate rain forest. A small population of mountain goats ranges over the area, as do black and brown bears, and moose. The shoreline is mostly rocky and receives little recreation use. There are two recreation cabins on inland lakes and one at saltwater near the mouth of Harding River. There is no known subsistence use in the area. Attractions include the natural features of the area and high quality fishing.

Wilderness Potential

The area is essentially unmodified except for the Tyee powerline and minor timber harvest conducted in 1955 on the north shore of Bradfield Canal. There is a high opportunity for solitude within the area. The sound of low-flying aircraft or the sight of boats might be the only invasions on solitude. The area provides primarily primitive recreation opportunities. The difficult land access and the presence of bears offer a high degree of challenge and a need for woods skills and experience.

Resources

The area contains 23,188 acres of tentatively suitable forest land. The potential for managing timber in this area is dependant upon market values and the development of harvest methods which do not require extensive roading. It will also require numerous log transfer facilities sites. Recreation potential includes additional outfitter/guide permits, trails, cabins or shelters. There is potential for various fish and wildlife enhancement projects in the area. The area generally has a low minerals rating and there are no known current claims. A 138 KV powerline under special use permit crosses part of the the area south of Bradfield Canal and there is the potential for development of another one. Most use of the area is associated with commercial fishing in Bradfield Canal and Blake Channel and with sport fishing in some of the major streams in the area. There has been some interest by residents of Wrangell in limiting the number of outfitter guides in the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	7,460	45,850	122,610	0
B	44,610	8,720	123,010	0
C	61,630	1,740	112,970	0
D	60,810	1,700	113,830	0
E	61,610	1,740	112,570	0
F	61,630	1,740	112,970	0
G	61,630	1,740	112,970	0

Consequences

In Alternative A, the Harding and Eagle River drainages are managed for old-growth, and have a high potential for Wilderness due to the management of the adjacent lands for Wilderness and primitive recreation. Tom's Creek is managed for primitive recreation, retaining Wilderness potential. The remaining area is managed for a mix of moderate and intensive development, not retaining any Wilderness potential. Alternative B is similar to Alternative A, except that its developed areas are more for intensive timber management. Alternatives C, E, F, and G are managed for Wilderness potential much like Altenative A. There are more areas of intensive development which do not have any Wilderness potential. Alternative D is managed much like Alternative A, except that the large area is managed for semi-primitive recreation.

(208) Bradfield

Gross acres: 212,872
National Forest acres: 212,872

Description

The Bradfield roadless area is located on the mainland and is bounded on the east and southeast by Misty Fiords National Monument, on the west by the Harding Roadless Area, and by the Canadian border on a minor portion of the northeast side. The area at the mouth of the Bradfield River, and areas extending up the valley bottoms of both forks of that river, have been extensively roaded and harvested and are excluded from the boundaries of this roadless area. The area is dominated by rugged mountains, with deep, narrow valleys containing the high-energy Bradfield and White Rivers which feed the head of Bradfield Canal. There are relatively small glaciers, numerous streams, waterfalls, and a small hot spring in the area. The area may have been used by the Tlingit in prehistoric and historic times. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include brown and black bear, mountain goats, moose, and bald eagles. The Bradfield River is important for producing salmon and steelhead. There are no public recreation facilities in the area, but brown bear, waterfowl and goat hunting is popular.

Wilderness Potential

The area is unmodified except for the harvest areas mentioned above. There is a high opportunity for solitude within the area. Boats and low-flying airplanes are common and may be observed in this area. Present recreation use levels are low except around the grassflats at the mouths of the rivers. The area provides primarily primitive non-motorized recreation opportunities.

Resources

The area contains 10,779 acres of tentatively suitable forest land. The timber remaining for harvest in the area is in areas where high development costs will preclude development for the immediate future. There is potential for outfitter and guide permits, trails, cabins and shelters in the area. There is potential for waterfowl enhancement and browse regeneration for moose. The area generally has a low minerals rating although the White River drainage is rated fairly high. A support camp and a power generating plant are under special use permit near the head of Bradfield Canal. Authorization has been given for a 69 KV power transmission line up the North Fork of the Bradfield River to the Canadian border. The State has appropriated $150,000 to complete an Environmental Impact Statement addressing the impacts associated with a road up the North Fork. Interest has developed from both the Canadian and Alaska State governments for a potential road access to Canada through this area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	202,520	0
B	0	0	202,520	0
C	131,440	800	70,290	0
D	38,340	340	163,850	0
E	131,440	800	70,290	0
F	131,440	800	70,290	0
G	131,440	800	70,290	0

Consequences

In Alternatives A and B, the area is managed for semi-primitive and primitive recreation, and retains Wilderness potential. In Alternatives C, E, F, and G most of the area is managed for intensive development, not retaining Wilderness potential. The remaining area around Mt. Cloud is managed for primitive recreation and retains Wilderness potential. In Alternative D, most of the area is managed for semi-primitive recreation, including the upper portions of the Bradfield River draiange, generally retaining its Wilderness potential. The lower reaches of the Bradfield River drainage are managed for intensive timber development, not retaining Wilderness potential.

(209) Anan

Gross acres: 37,933
National Forest acres: 37,933

Description

The Anan roadless area is located on the mainland and has six miles of shoreline on Ernest Sound, but is otherwise surrounded by other roadless areas. The area is dominated by rounded mountains and hills, between which are deep, narrow valleys containing two forks of Anan Creek and two long, narrow lakes. The area was inhabited by the Tlingit in prehistoric times and several cultural sites are known. Vegetation is typical southeast Alaska temperate rain forest. The largest concentration of black bears in southeast Alaska exist here, as well as brown bear, bald eagles and other birds which concentrate here due to the fish runs, and goats. Anan Creek produces the most pink salmon of any stream on the Stikine Area. There is one recreation cabin, a bear observatory, and trails up both forks of the creek. The area at the mouth of Anan Creek receives heavy use by people (including many from Wrangell, Petersburg, and Ketchikan) who come to camp, fish, and observe the wildlife. Good anchorage, frequently used by outfitter/ guides, is found off the mouth of the creek. Salmon have been gathered from this area for subsistence use in the past. A fish ladder at the bear observatory is managed by ADF&G.

Wilderness Potential

Most of the area appears natural and unmodified, except for the facilities at the mouth of Anan Creek which are constructed of natural materials. Continued public demand and increases in use will likely chip away at the area's natural integrity. There is a low opportunity for solitude in the bay, but opportunity increases as one moves away from the mouth of the creek, or in the off season. The area provides primarily primitive recreation opportunities. Travel on land is difficult, offering a high degree of physical challenge.

Resources

The area contains 8,063 acres of tentatively suitable forest land. There are no plans to harvest timber in the area. The area has been proposed as wilderness in pending Tongass legislation. There is potential for additional outfitter/guide permits, trails, cabins or shelters, as well as for further improvements to existing facilities for barrier-free access. There is potential to improve fish access into the two large lakes in the upper watershed. Public demand to observe the black bear concentrations has increased dramatically. Levels of disturbance to bears need to be determined along with future recreation goals for the area. The 138 KV Tyee power transmission line crosses the north edge of the area. A Native historic site has been selected in the Anan Bay area. There is one inventoried potential Research Natural Area, but is not a priority area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	140	37,850
B	0	0	37,990	0
C	0	0	37,990	0
D	0	0	37,990	0
E	0	0	140	37,850
F	0	0	37,990	0
G	0	0	37,990	0

Consequences

In Alternatives A and E, the entire area is recommended as Wilderness. In Alternative B, the entire area is managed for old-growth, and the others are managed for primitive recreation, all retaining Wilderness potential.

(210) Frosty

Gross acres: 41,395
National Forest acres: 41,395

Description

The Frosty roadless area is located on the mainland and is bounded on the west by Ernest Sound and Seward Passage, and by other roadless areas on three sides. The area is generally characterized as complex terrain dominated by rounded mountains and hills rising steeply from saltwater, between which are low valleys containing short streams. Frosty and Sunny Bays provide good anchorages. The area was inhabited by the Tlingit in prehistoric times. In the 1930-40's there were salmon canneries located at Point Ward and in Santa Anna Inlet. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include black and brown bears, wolves, deer, and some goat. Geese nest in Frosty Creek, and swans winter at Lake Helen in Santa Anna Inlet. Lake Helen is also a popular sport fishing site for resident trout. Generally this area is not a large producer of anadromous fish. Trapping occurs along the beach fringe. There are no public recreation facilities and inland use is light. There is no known subsistence use in the area.

Wilderness Potential

The area has not been modified, except for the minor timber harvest in Frosty Bay which took place about 30 years ago, and some cannery remains. There is a high opportunity for solitude within the area, especially once one moves away from the beach a short distance. Boats or airplanes passing by or entering one of the bays may be observed, but such influences are not widespread. The area provides primarily opportunities for primitive recreation. Travel on land is difficult, offering a high degree of physical challenge.

Resources

The area contains 11,411 acres of tentatively suitable forest land. A timber sale is currently being planned for the Frosty drainage with construction of a log transfer facility near the mouth of Frosty Bay. There is potential for outfitter and guide permits, trails to some of the lakes, and additional cabins or shelters. There is potential for fish and wildlife resource projects, but none are planned. The area has a low minerals rating and there are no known mining claims.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	9,430	24,820	7,040	0
B	31,470	2,780	7,140	0
C	35,390	600	5,400	0
D	35,290	600	5,500	0
E	35,390	600	5,300	0
F	35,390	600	5,400	0
G	35,390	600	5,400	

Consequences

In all alternatives, the area is managed for moderate and intensive development, including timber harvest, which precludes Wilderness potential, except for a small area managed for semi-primitive recreation along the coast of Ernest Sound south of Point Warde.

(211) North Kupreanof

Gross acres: 138,623

National Forest acres: 116,666

Description

North Kupreanof roadless area is located on the north end of Kupreanof Island adjoining the community of Kake to the west, and South Kupreanof roadless area and the Petersburg Creek-Duncan Salt Chuck Wilderness to the south. Frederick Sound forms the northern boundary. Landforms along this area are characterized by uniformly rolling lowlands. Bohemia Ridge provides topographic relief to essentially flat terrain. Muskeg/scrub timber complexes on wet areas are extensive, while timbered slopes are typical southeast Alaska temperate rain forest. Traditional and subsistence uses have been concentrated around the lower reaches of Cathedral Falls Creek and the Hamilton River, but there are no known unique cultural or historic resources in the area. The majority of this area has low habitat qualities, but there are deer, moose, waterfowl and black bear. The areas immediately adjacent to saltwater or major creeks are valued for recreation uses such as black bear and waterfowl hunting, camping, sport fishing, as well as subsistence activities. The adjacency of this area to Kake, and to planned timber sales in Portage Bay area, will influence the future management of this area.

Wilderness Potential

The area is essentially unmodified, although adjacent harvest activities are evident in some areas. There is a high opportunity for solitude in the area. Use of floatplanes and powerboats may be present for brief periods. The area provides primarily primitive and semi-primitive non-motorized recreation opportunity.

Resources

The area contains 19,928 acres of tentatively suitable forest land. Timber values are generally low and development costs, though moderate, are still too high for economical development. However, the proposed Bohemia Mountain Timber Sale is undergoing additional scoping and interdisciplinary review. Recreation potential in this area is moderate, reflecting its proximity to Kake. The area could be accessed by foot from the adjacent road system, with appropriate trail development. There is potential for fish enhancement projects. Moose and deer habitat improvement projects are planned for the area. There are no inventoried areas with high mineral development potential. A proposed 240 acres have been selected by the State. The area is of concern to local residents of Kake as future timber sales may provide employment and other opportunities. If a road connection from Kake to Petersburg were built, it would cross this roadless area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	71,350	31,910	12,660	0
B	80,800	22,880	12,260	0
C	113,550	2,150	240	0
D	100,980	4,270	10,690	0
E	113,530	2,150	240	0
F	113,550	2,150	240	0
G	113,550	2,150	240	0

Consequences

In all alternatives, the area is managed intensively for timber production with a few small fragmented areas that remain undeveloped. There is no potential for Wilderness.

(212) Missionary

Gross acres: 14,005

National Forest acres: 14,005

Description

The Missionary roadless area is located on the northern portion of the Lindenberg Peninsula, on Kupreanof Island, about 12 miles northwest of Petersburg. It has one mile of shoreline on Frederick Sound to the east, while from Portage Bay to the west, a logging road system accesses three sides. The area is characterized by steep slopes, glacial cirque lakes, and an alpine ridge line. There are four lakes high on the flanks of the mountains. The area was once inhabited by the Stikine Tlingit, although there are no cultural resource sites in evidence. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include Sitka black-tailed deer and black bear. Fishing and hunting are the main recreational uses in the area, but deer hunting has been closed for the last fifteen years. Most use is concentrated along the outside edges which are accessible by roads, but overall use levels are low. There is some subsistence use in the area. Special features might include the uncommon grayling found in one small lake in the region and an unusual mineral outcrop near the east side of the area.

Wilderness Potential

The area itself is unmodified, however its overall integrity is not considered pristine due to the adjacent roads and timber harvests. The irregular shape of the area, and penetration of roads and timber harvest up the Todahl Creek Valley, also have likely impacted the area's natural integrity. There is a moderate opportunity for solitude within the area. Air, boat, and vehicle traffic may be heard in the area, and timber harvest activities are heard when they do occur. The area provides semi-primitive recreation opportunity. There are no developed recreation opportunities in this area.

Resources

The area contains 3,683 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on market values. A road system and/or logging systems would be necessary, and nearby roads could be extended to accomplish much of this. There is some potential for outfitter/guide permits, trails, and cabins and/or shelters. There is some potential for adjacent recreation activities to spill into the area, such as mountain biking or off-road vehicle use. No fish or wildlife habitat improvement projects are planned. The area has low minerals development potential. Numerous special use permits exist within parts of this area, including a Coast Guard reservation, roads, logging camp, log dump, and public recreation cabin.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	13,850	160	0
B	4,640	9,200	160	0
C	7,660	6,300	20	0
D	13,630	240	140	0
E	7,660	6,300	20	0
F	7,660	6,300	20	0
G	7,660	6,300	20	0

Consequences

In Alternative A, the entire area is managed for moderate development and in Alternative D the entire area is managed for intensive development. In all other alternatives, the area is managed for a mix of moderate and intensive development. None of the alternatives have any Wilderness potential.

(213) Five Mile

Gross acres: 20,297
National Forest acres: 19,438

Description

The Five Mile roadless area lies along the eastern shore of the Lindenberg Peninsula on Kupreanof Island at Five Mile Creek, and includes the Sukoi Islets in Frederick Sound. Areas to the north are defined by roads and harvest areas, and the south is bounded by Petersburg Creek-Duncan Salt Chuck Wilderness. Petersburg lies five miles to the south across Wrangell Narrows. Landforms along this area are characterized by a glacier-fed stream, Five Mile Creek, and steeply-rising mountain slopes. Several historic resources exist in this area. Vegetation is typical southeast Alaska temperate rain forest. The areas immediately adjacent to saltwater or major creeks are valued for recreation uses such as black bear hunting, hiking, fishing, and beach combing. Two trails exist in this area, both beginning at saltwater, which are used primarily by Petersburg residents. The Sukoi Islands lie in a primary marine route for pleasure and commercial boat traffic, including the Alaska State ferries, and have good anchorages themselves.

Wilderness Potential

The area is essentially unmodified. External influences include the roaded northern end of the peninsula, heavy boat traffic in Frederick Sound, and the community of Kupreanof to the southeast. There is high opportunity for solitude in this area away from these areas. The area provides primarily primitive and semi-primitive motorized recreation opportunity.

Resources

The area contains 5,259 acres of tentatively suitable forest land. There are good timber values in this area, however high roading costs and high scenic values will need to be recognized. Recreation potential for the area is moderate to high, including additional trails, cabins or shelters. The area displays a wide variety of setting in a compact area that is easily accessible from Petersburg and Kupreanof. Wildlife habitat improvement projects, such as browse enhancement, have potential. There are no inventoried areas with high mineral development potential. There is continued interest in future road access from Kake to Kupreanof, which would require access through this area. Fifty acres of this area are private landholdings, and 600 acres are proposed for State land selection. A special use permit exists for an electronics site on top of Petersburg Mountain.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	560	11,240	7,640	0
B	5,580	7,280	6,580	0
C	6,280	12,360	800	0
D	11,860	1,240	6,340	0
E	6,280	12,360	800	0
F	6,280	12,360	800	0
G	6,280	12,360	800	0

Consequences

In all alternatives, the area near Petersburg Mountain is managed for primitive recreation, and because it is adjacent to Petersburg Creek-Duncan Salt Chuck it retains its Wilderness potential. In all the alternatives, the rest of the area is managed as a mix of moderate and intensive development, not retaining any Wilderness potential.

(214) South Kupreanof

Gross acres: 209,957
National Forest acres: 209,957

Description

The South Kupreanof roadless area is generally surrounded by other roadless areas, except on the northeast corner where it adjoins the Petersburg Creek-Duncan Salt Chuck Wilderness area. Technically, it doesn't reach the southern shoreline along Sumner Strait, due to the presence of clearcutting and roads which occurred in the 1960-70's. There are a few good anchorages along the southern shore, and also within Duncan Canal. The area is low-lying, rolling terrain with little relief. The southern shorelines and along Duncan Canal were probably used extensively by the Tlingit, although there is only incidental evidence, such as pitch trees. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer and moose which appear to be a growing population. The area contains either the entire stream or the headwaters of approximately twenty ADF&G numbered salmon producing streams. Generally, this area is a good producer of anadromous fish. Attractions include the areas immediately adjacent to saltwater or major creeks which are highly valued for recreation uses such as black bear and waterfowl hunting, camping, trapping, beach combing, and sport fishing. Stone columns produced by erosion formed the "totems" at the head of Totem Bay. Overall, the area receives light recreational use. There are two out-of-service recreation cabins.

Wilderness

The area is essentially unmodified, except for the southern beach areas which have been heavily harvested and roaded and are seen by ferry and cruiseship passengers. There is a high opportunity for solitude in the area. Use of floatplanes and motorboats may disrupt visitors for brief periods. The area provides primarily primitive and semi-primitive non-motorized recreation opportunity.

Resources

The area contains 45,602 acres of tentatively suitable forest land. The North Irish Timber Sale activities will continue in the northern half of VCU 429. Analysis will be done in the near future to see if the Totem Timber Sale is still viable. Overall recreation potential for the area is low as activities are limited. There is potential for some fish and wildlife habitat enhancement projects. There are no inventoried areas with high mineral development potential in the area. Three VCU's have been identified as part of the West Duncan proposed wilderness in pending Tongass legislation. There is high interest by local users in maintaining Duncan Canal in its natural state for recreational use, although remaining lowlands are lacking interest to the average user.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	90,630	29,560	14,810	74,950
B	166,900	16,060	27,000	0
C	178,860	29,540	1,560	0
D	193,000	5,030	11,930	0
E	131,380	3,570	60	74,950
F	178,860	29,540	1,560	0
G	178,860	25,540	1,560	0

Consequences

In Alternatives A and E, the West Duncan Canal is proposed as Wilderness. The remaining area is mostly managed for moderate and intensive development, precluding Wilderness potential. Except for a small area in the center of Kupreanof in Alternative B which is managed for semi-primitive recreation, but has low Wilderness potential because of its location, the rest of the altenatives are managed mainly for intensive timber development, without any potential as Wilderness.

(215) Castle

Gross acres: 49,360

National Forest acres: 49,360

Description

The Castle roadless area is located along the southwest shore of Duncan Canal on the southeast corner of Kupreanof Island. It is just north of Kah Sheets Bay, and includes Castle River Estuary and flats. Technically, the area does not reach the shoreline along Kah Sheets Bay or Little Duncan Bay due to the presence of clearcutting and roading which occurred in the mid 1970's. Its western boundary is another roadless area. The community of Petersburg lies 20 miles to the northeast. The area is characterized by uniformly-rolling to moderately-steep hills, with fairly extensive areas of lowlands in-between. The shorelines along the southern boundary and along Duncan Canal were probably used by the Tlingit. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include some deer, black bear, waterfowl, and a growing moose population. Castle River and Kah Sheets are noted for good spring steelhead fishing, and coho fishing in the late summer. There are four recreation cabins and three developed trails, some of which are planked, in the area and recreation use is fairly intense. The areas immediately adjacent to saltwater or major creeks are highly valued for recreation uses such as black bear and waterfowl hunting, camping, beach combing, and sport fishing. There are a series of small islands off the mouth of Castle River which have limestone cliffs and caves.

Wilderness Potential

The area is essentially unmodified and appears natural along Duncan Canal, except for the harvested area along the beach. There is high opportunity for solitude in the area, except around the cabins and trails. Use of floatplanes and motorboats may disrupt visitors for brief periods. The area provides primarily primitive and semi-primitive non-motorized recreation opportunities.

Resources

The area contains 10,972 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent upon the development of high market values and the development of less expensive access methods. Recreation potential for the area is high due to its proximity on relatively sheltered waters to Petersburg. There is potential for additional cabins, trails, and outfitter/guide permits. Both fish and wildlife enhancement projects have been identified. A barite mine operated in the 1960-70's, but there are no active claims today. Private lands make up 5.3 acres of this area. Most of the area is identified as a proposed wilderness in pending Tongass legislation. High interest exists by local users in maintaining Duncan Canal in a natural state for recreational use.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	3,530	280	660	44,890
B	21,040	16,210	12,110	0
C	17,960	29,480	1,920	0
D	41,770	860	6,730	0
E	4,450	20	0	44,890
F	17,960	29,480	1,920	0
G	17,960	29,480	1,920	0

Consequences

In Alternatives A and E, almost the entire area is recommended as Wilderness. The rest of the alternatives are managed for a mix of moderate and intensive development, precluding Wilderness potential. Alternative B has some scattered natural areas which would qualify for Wilderness.

(216) Lindenberg

Gross acres: 28,337
National Forest acres: 22,797

Description

The Lindenberg roadless area lies inland on the Lindenberg Peninsula on Kupreanof Island, directly south of the Petersburg Creek-Duncan Salt Chuck Wilderness. The city of Petersburg lies one mile to the east across Wrangell Narrows, and the city of Kupreanof and State land are adjacent to the east side of the area. The area is characterized by steep mountain slopes divided by two major drainages, Duncan Creek and Coho Creek. This area was within the former territory of the Stikine Tlingit which is evidenced by campsites, fort sites, garden areas, and fish weirs. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, moose, and waterfowl. The areas immediately adjacent to saltwater or major creeks are valued for recreation uses such as black bear hunting, hiking, beach combing and sport fishing. The Duncan Canal Portage Trail, which is not an official trail, provides one of the few extended hiking opportunities in the area. This loop trail of about 30 miles includes the adjacent Wilderness and ties in numerous recreation amenities, including encountering numerous ecotypes in one area. This area is adjacent to the community of Kupreanof, and to land owned by State of Alaska and Petersburg which will most likely lead to continued development of homesites, which may not be compatible to long-term roadless maintenance of the area.

Wilderness Potential

The area is essentially unmodified, although areas adjacent to private land are likely to change in character as development occurs. There is a high opportunity for solitude in the area, except around specific recreation areas. Use of floatplanes and powerboats may disrupt visitors for brief periods. The area provides primarily semi-primitive non-motorized recreation opportunities.

Resources

The area contains 7,920 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent upon the development of stable market values and the ability to develop cost effective transportation of logs. Recreation potential for the area is high, due to the proximity to Petersburg and the adjacent Wilderness. There is potential for additional outfitter/guide permits, and the development of cabins and/or shelters. Additional opportunities for trails would create more loop options. Browse, winter range, and waterfowl habitat improvement projects are planned for the area. Three recreation cabin special use permits are present. The State has selected 3,515 acres at Coho Creek. Many local residents want this area to remain unroaded and undeveloped as long as possible.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,940	9,100	11,760	0
B	11,680	9,740	1,380	0
C	11,620	11,060	120	0
D	10,740	11,060	1,000	0
E	11,620	11,060	120	0
F	11,620	11,060	120	0
G	11,620	11,060	120	0

Consequences

In Alternative A, a portion of the area adjacent to the Wrangell Narrows is managed for old-growth and retains moderate potential for Wilderness. The other alternatives are essentially managed for a mix of intensive and moderate development, precluding Wilderness potential.

(217) Green Rocks

Gross acres: 12,439

National Forest acres: 10,380

Description

The Green Rocks roadless area is located on the Lindenberg Peninsula on Kupreanof Island, adjacent to Wrangell Narrows and Duncan Canal. Extensive roading and logging exist to the north. The area is comprised of one major drainage and several small ones, and is characterized by rolling, subdued topography and extensive muskeg areas. The area was used by the Stikine Tlingit in prehistoric and historic times as is evidenced by the remains of a village site, fort site, and several fish weirs. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, black bear, and moose. Green Rocks Lake, Green Rocks Trail, and several popular waterfowl hunting areas provide the great attraction to the recreating public. Land adjacent to this area was selected by the State of Alaska, which then sold numerous parcels through the land lottery programs. Many of these land owners have built permanent residences on their property.

Wilderness Potential

The area is unmodified except for the existing recreation cabins, residences and trail. There is a moderate opportunity for solitude within the area. Low-flying airplanes, Alaska State ferries which travel within one quarter mile of the area, and other boaters may be observed by people in this area. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities.

Resources

The area contains 3,360 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on the development of a road system or harvest methods which do not require extensive roading, although one log transfer facility may be needed. There is potential for additional outfitter and guide permits, and for developed trails and cabins or shelters. Browse, winter range, and waterfowl habitat improvement projects are planned in the area. There are no inventoried areas with high mineral development potential. The State has selected about 2,000 acres concentrated near the shoreline; some of these are currently private landholdings.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	4,980	5,400	0
B	1,840	6,520	2,020	0
C	2,560	7,360	460	0
D	5,100	3,500	1,780	0
E	2,560	7,360	460	0
F	2,560	7,360	460	0
G	2,560	7,360	460	0

Consequences

In Alternative A, an area adjacent to Wrangell Narrows is managed for old-growth and remains undeveloped and has marginal potential as Wilderness. The remaining area is managed as moderate development. The rest of the alternatives are managed as a mix of intensive and moderate development, precluding Wilderness potential.

(218) Woewodski

Gross acres: 10,396
National Forest acres: 10,376

Description

The Woewodski roadless area is located on Woewodski Island, south of Kupreanof Island where the Wrangell Narrows and Duncan Canal meet. The island is comprised of four major drainages, flat muskegs to the northeast, and Harvey Lake in the northwest. The area is close to Petersburg on relatively sheltered waters. The area was used by the Tlingit in prehistoric and historic times. The area is unique in its extent of mineral wealth, including gold. Various companies have held rights to the island's mineral wealth since the early 1900's. The area is typical southeast Alaska temperate rain forest. Wildlife include black bear and a small population of deer. There are two recreation cabins, and on trail connecting Harvey Lake to Duncan Canal. In the summer, fishing for silver salmon takes place around the cabin. The area is primarily used for recreational purposes, with Petersburg residents and those from the Beecher Pass homesites making use of the trail and cabins. There is no known subsistence use in the area. Special features include its natural characteristics and the remnants of old mines.

Wilderness Potential

The area is unmodified except for the cabin, residences, and trail located on the northern end of the island. There is moderate opportunity for solitude within the area. Low-flying airplanes, the ferry, and recreation boaters may at times pass by the area. The area provides primarily primitive non-motorized recreation opportunity. Recreation use is low except around the cabins and trail.

Resources

The area contains 5,379 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on high market values, and the resolution of resource conflicts. One log transfer facility would be necessary. There is potential for additional outfitter/guide permits and for developed trails and additional cabins or shelters. There is one special use recreation residence permit on the north shore, one private residence, and one private mining property near the Harvey Lake trailhead. Wildlife habitat improvement projects are planned for the area. The area has an abundant supply of minerals, and mineral exploration activity has increased in the last few years. Claims cover 90 percent of the island. Private landholdings total 38.72 acres. There are no State or Native land selections within this area. During the planning for the Woewodski Timber Sale, intense local opposition developed from residents in the Beechers Pass area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	0	10,380
B	1,100	5,280	4,000	0
C	0	8,720	1,660	0
D	6,220	1,040	3,120	0
E	0	0	0	10,380
F	0	8,720	1,660	0
G	0	8,720	1,660	0

Consequences

In Alternatives A and E, the entire area is recommended as Wilderness. In the rest of the alternatives, the area is managed for a mix of management uses, and does not retain any potential as Wilderness.

(219) North Mitkof

Gross acres: 9,713

National Forest acres: 5,876

Description

The North Mitkof roadless area is located on the northern portion of Mitkof Island, adjacent to and just southeast of the city of Petersburg. State land surrounds the area on three sides with its associated roads and timber harvest areas, while the northeastern portion is adjacent to Frederick Sound. The area was claimed by several Stikine Tlingit clans who used the area for hunting and trapping; however, there are presently no recorded cultural resource sites. Vegetation is typical southeast Alaska temperate rain forest. A small population of deer and black bear range over the area. There are two trails and one recreation cabin and the area receives relatively heavy recreational use. Wintertime use of the area is growing, with cross-county skiing where suitable. Hunting, fishing, and woodcutting are all popular activities. There is some subsistence use in the area. Much of the land in this area has been selected or is being considered for selection by the State and the city of Petersburg, which gets its drinking water from a watershed located primarily in this area. The proximity to Petersburg makes portions of this area attractive to a variety of uses, community expansion, recreation, and various forms and intensities of resource utilization such as timber, rock sources, utility corridors, and special uses.

Wilderness Potential

The area is unmodified and has maintained its overall integrity. There is a moderate to low opportunity for solitude within the area. Air and marine traffic pass nearby, the trail and cabin concentrate users, noise and sights of timber sales may occur, and the town of Petersburg can be seen and heard from some locations. The area provides primarily semi-primitive non-motorized recreation opportunity.

Resources

The area contains 1,879 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on market values and road or logging systems capable of harvesting the area. There is potential for outfitter and guide permits and for additional ski and summer trails, cabins, shelters, and roaded recreation activities, such as sightseeing and downhill ski development. No fish habitat enhancement projects are planned, and it is unlikely that wildlife improvements will take place in the area. The area has low minerals potential. Portions of the area are identified for community expansion and development. The municipal watershed makes portions of the area extremely valuable. Other portions of the area are traditional and/or popular recreation areas for local users.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,180	780	3,920	0
B	1,940	820	3,120	0
C	2,100	2,420	1,360	0
D	1,960	800	3,120	0
E	2,100	2,420	1,360	0
F	2,100	2,420	1,360	0
G	2,100	2,420	1,360	0

Consequences

In all alternatives, a small area adjacent to the community of Petersburg remains undeveloped but is too small to be considered as having Wilderness potential. The area is generally managed for a mix of uses, including old-growth, intense timber development, and recreation and does not have any potential as Wilderness.

(220) East Mitkof

Gross acres: 10,350

National Forest acres: 10,250

Description

The East Mitkof roadless area is located on the eastern side of Mitkof Island, adjacent to the southern end of Frederick Sound, eight miles southeast of the city of Petersburg. Forest roads and harvest units generally make up the rest of the irregularly shaped land boundaries. The area generally slopes to the east in a gentle manner; terrain in the northern portion is nearly flat. The area was inhabited by several clans of the Stikine Tlingit. An abandoned village site and petroglyphs are reported in the vicinity of Ideal Cove. Vegetation is typical southeast Alaska Temperate rain forest. Wildlife include black bear, a small population of deer, and a few moose. Due to its proximity to Petersburg and easy accessibility, the area receives relatively heavy recreational use centered around the Three Lakes area which has a system of interconnecting trails, which in itself is unique to southeast Alaska. The trails are short and gentle, and some are planked, adding to their popularity. Wintertime use of the area is increasing, especially snowmobile use and some cross-country skiing. Hunting, fishing and woodcutting are all popular activities. There is some subsistence use in the area.

Wilderness Potential

The area has maintained its overall integrity, except for the plank trails and minor development at the lakes. However, adjacent management activities have likely impacted some of the natural integrity of this area. There is a moderate to low opportunity for solitude within the area. Air traffic and marine traffic pass nearby, trails and lakes concentrate users, and timber harvest activities when occurring would impact users. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 3,083 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on market values. A road system and/or logging systems capable of harvesting the area would be necessary, although nearby roads could be extended to accomplish some of this. There is potential for outfitter/guide permits, winter trails, and additional summer trails. Potential also exists for additional cabins, shelters, and roaded recreation activities. Ideal Cove, an area of about 900 acres, was selected by the State. In cooperation with the State, it could provide an important trail access to the Stikine-LeConte Wilderness and be used more extensively by watercraft. The area has low minerals potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,120	600	8,530	0
B	4,020	1,540	4,680	0
C	6,060	3,580	600	0
D	7,310	340	2,600	0
E	6,060	3,580	600	0
F	6,060	3,580	600	0
G	6,060	3,580	600	0

Consequences

In Alternative A, the area is managed primarily for old-growth habitat and retains moderate potential for Wilderness. In the other alternatives, the area is managed for a mix of uses, including intensive timber harvest and none of the area retains potential as Wilderness.

(223) Manzanita

Gross acres: 8,070
National Forest acres: 7,850

Description

The Manzanita roadless area is located on the southeast corner of Mitkof Island, about 18 miles southeast of the city of Petersburg. Forest roads, harvest units, and the Mitkof Highway generally make up the irregularly-shaped land boundaries, with just one mile of shoreline on saltwater. The area exhibits great relief, as the core is made up of a ridge system with moderate to steep slopes, and drainages oriented in all directions. There is one small pond near the southwest corner. The area was claimed by the Stikine Tlingit clans, although no aboriginal sites have been recorded within this area. Vegetation is typical southeast Alaska temperate rain forest. A population of deer and black bear, and possibly a few moose, range over the area. The proximity to Petersburg by roaded access makes portions of this area attractive for recreation, including hunting, woodcutting and gathering, and snowmobiling. Some of the use is likely for subsistence. There are no developed recreation opportunities in the area.

Wilderness Potential

The area is unmodified, however its overall integrity is
not considered pristine. Adjacent management activities have likely impacted some of the natural integrity of this area, such as wildlife. The irregular shape of the area also lessens its natural integrity. There is a low opportunity for solitude within the area. Air traffic and vehicle traffic pass nearby and timber harvest activities in adjacent areas would have a significant impact on solitude when they occurred. The area provides some semi-primitive recreation opportunity.

Resources

There are 2,684 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on market values. A road system and/or logging systems capable of harvesting the area would be necessary, although nearby roads could be extended to accomplish some of this. There is potential for trails, and possibly shelters, to access the ridgelines and saltwater. There is some potential for interpretive activities due to its accessibility and proximity to the existing interpretive tour of the Mitkof Highway and Three Lakes Road. The area has low minerals potential. Maintenance of the area in a roadless condition enhances opportunities for certain wildlife and traditional recreation activities.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,740	5,830	280	0
B	5,670	1,900	280	0
C	4,930	2,900	20	0
D	7,310	260	280	0
E	4,930	2,900	20	0
F	4,930	2,900	20	0
G	4,930	2,900	20	0

Consequences

In all alternatives, this small area is fragmented with a mix of management prescriptions, including intensive management for timber harvest, and has no potential as Wilderness.

(224) Crystal

Gross acres: 21,794

National Forest acres: 19,293

Description

The Crystal roadless area is located on the southwest corner of Mitkof Island, about 15 miles southwest of the city of Petersburg. Forest road, harvest units, and the Mitkof Highway form the irregularly shaped land boundaries, with just six miles of shoreline on saltwater. Two mountainous areas dominate the landform: Crystal Peak to the north and the northern portion of the Sumner Mountains to the south. Crystal Lake is a significant waterbody to the north. The area was claimed by several Stikine Tlingit clans and used for hunting and gathering of subsistence items. Evidence of their use is indicated by the remains of temporary camps, fish weirs, petroglyphs, and bark-stripped trees. Vegetation is typical southeast Alaska temperate rain forest. A population of deer and black bear range over the area, as do some moose. Due to its proximity to Petersburg and accessibility by road and water, the area receives moderate recreational use, consisting primarily of hunting, berry picking and woodcutting. There is one trail from the State's Crystal Lake Fish Hatchery to Crystal Lake, which provides water for the hatchery and its residents. Some State land selections have occurred or are pending in the southern portion. The western portion has been selected by the State, and selections are pending which encompass Crystal Lake.

Wilderness Potential

The area is unmodified, however its overall integrity is not considered pristine. Adjacent management activities have likely impacted some of the natural integrity of this area, such as wildlife. The irregular shape of the area and inclusion of private land also lessen its natural integrity. There is a low to moderate opportunity for solitude within the area. Air traffic and vehicle traffic pass nearby, and timber harvest when occurring would have a significant impact on solitude. The area provides some semi-primitive recreation opportunity.

Resources

The area contains 5,764 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on market values and the construction of a road system or logging systems capable of harvesting the area. There is potential for trails and shelters to access the ridgelines. There is some potential for interpretive activities due to the area's accessibility and proximity to the existing interpretive tour of the Mitkof Highway and Three Lakes Road, and the popular Blind Slough recreation site. The extensive alpine area is an attraction for recreationists. Support for a trail to the ridgeline and alpine terrain above Crystal Lake has evolved from several recreation public meetings. There are three special uses in the area. The area has low minerals potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	10,290	9,010	0
B	0	12,980	6,340	0
C	0	18,670	620	0
D	16,670	2,100	520	0
E	0	18,670	620	0
F	0	18,670	620	0
G	0	18,670	620	0

Consequences

In Alternative A, a portion of the area south of Blind Slough is managed for old-growth habitat and retains a low potential as Wilderness. Alternatives B, D, E, F, and G are managed for a mix of moderate development activities and have no Wilderness potential. Alternative D is managed entirely for intensive timber development and has no Wilderness potential.

(225) Kadin

Gross acres: 1,623

National Forest acres: 1,623

Description

The Kadin roadless area consists of Kadin Island located off the mouth of the Stikine River where Sumner Strait, Stikine Strait and Eastern Passage converge. At low tides it is nearly surrounded by tideflats formed by the sediments of the Stikine River. The island rises fairly steeply and uniformly to a height just above 1,000 feet, giving it its local name of High Island. Soils are unique because of the influence of the Stikine River. High winds moving down the Stikine River canyon pick up silt from the unvegetated glacial river floodplain and deposit it as loess on islands at the river's mouth. Few areas in the world have a combination of high rainfall and recent loess deposition, so the properties of the soils here are of special interest. This soil also causes a unique form of high productivity Sitka spruce/devil's club forest type. A small population of deer and black bear range over the island. There is some subsistence use in the area. There are no developed recreation opportunities in the area.

Wilderness Potential

The area is unmodified, and has maintained its overall natural integrity. There is a low to moderate opportunity for solitude within the area. Air and marine traffic pass nearby, and timber harvest or other activities in adjacent areas would have a significant impact on solitude when occurring. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 1,122 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on highmarket values. Development of beach access and log transfer sites would also be required, both of which would be difficult. There is some potential for outfitter and guide permits, or for developed trails, cabins, or shelters. The area has been inventoried as a potential Research Natural Area. Maintenance of the area in a roadless condition enhances opportunities for certain wildlife, and for further consideration as a Research Natural Area. It could also be added to the existing adjacent Stikine-LeConte Wilderness.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	1,620	0
B	0	0	1,620	0
C	0	980	640	0
D	0	0	1,620	0
E	0	980	640	0
F	0	980	640	0
G	0	980	640	0

Consequences

In Alternatives A and B, Kadin Island is managed as a Research Natural Area and retains Wilderness potential. In Alternatives C, E, F, and G, Kadin Island is managed for moderate levels of development and has no Wilderness potential. In Alternative D, the area is managed for semi-primitive recreation and retains its Wilderness potential.

(226) Greys
Gross acres: 361
National Forest acres: 361

Description

The Greys roadless area consists of one small island located off the mouth of the Stikine River where Sumner Strait, Stikine Strait, and Eastern Passage all converge. Greys Island and landform, which is completely covered with forest, is basically oval-shaped and rises gently to a height of just above 400 feet. The Stikine Tlingit claimed this island which was named for a Russian ship used to transport land surveyors. The soils are unique because of the influence of the Stikine River. High winds moving down the Stikine River canyon pick up silt from the unvegetated glacial river floodplain and deposit it as loess on islands at the river's mouth. Few areas in the world have a combination of high rainfall and recent loess deposition, so the properties of the soils here of of special interest. The unique soils result in the occurrence of a unique form of high-productivity Sitka spruce/devil's club forest type. A small population of deer and black bear range over the area, but there are no fish streams on the island. There are no developed recreation opportunities in the area, and most use of the area is for marine-oriented recreation. During the salmon fishing season, the area adjacent to the island is a very popular fishing location.

Wilderness Potential

The area is unmodified, and has maintained its overall integrity. There is a low to moderate opportunity for solitude within the area. Low-flying airplanes and frequent marine traffic pass nearby, and timber harvest or other activities in the adjacent areas would have a significant impact on solitude when they are occurring. The area provides semi-primitive recreation opportunity.

Resources

The area contains 301 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on high market values. A road system and/or logging systems capable of harvesting the island would necessary. Development of beach access and log transfer sites would also be required and are likely to be difficult. There is some potential for outfitter and guide permits or for developed trails, cabins, or shelters. The area has low minerals potential. Maintenance of the area in a roadless condition enhances opportunities for certain wildlife. The area could be a substitute for Kadin Island as a candidate Research Natural Area, however the overall qualities are not as good in meeting the objectives. It could also fit in with the existing management of the adjacent Stikine-LeConte Wilderness.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	100	260	0
B	0	100	260	0
C	0	140	220	0
D	140	20	200	0
E	0	140	220	0
F	0	140	220	0
G	0	140	220	0

Consequences

In all alternatives, the island is managed for moderate or intensive development and because of its small size this would preclude it from Wilderness consideration.

(227) North Wrangell

Gross acres: 14,460

National Forest acres: 11,624

Description

The North Wrangell roadless area is basically a mountain ridge forming the northern tip of Wrangell Island, with four somewhat rounded peaks having steep drainages containing small streams emptying into salt water. Land access roads and closely associated clearcut timber harvest units bound the area on three sides. The east side is defined by saltwater which is now State owned land. Future uses of that land is uncertain, however some development is likely. A 138 KV powerline crosses the area near its center. The area was used by the Stikine Tlingit in prehistoric times, however only a few sites have been recorded, including a former camp and a possible burial site. Vegetation is typical southeast Alaska temperate rain forest. Important wildlife species include deer, wolves, black bear, marten and a small population of moose. Two trails and a shelter are the only facilities in the area, which is accessible by boat and automobile from the community of Wrangell in less than two hours. The Institute Trail is one of the few trails easily accessible to a major population center on the Stikine Area and it receives relatively heavy use. The shoreline currently receives little recreation use, but areas where roads cross the larger streams receive higher use during the summer.

Wilderness Potential

The area's natural integrity has been impacted by the roads and clearcut harvests surrounding it, and the powerline crossing near the center. There is a good opportunity for solitude within the area, especially after one has gone a short distance from the roads. The area provides primarily semi-primitive recreation opportunities. The character of the landforms and vegetation generally allows the visitor to feel remote from the sights and sounds of human activity which surround the area.

Resources

The area contains 4,522 acres of tentatively suitable forest land. The potential for managing timber in this area is high as roads could be extended from the exisiting system and much of the area could be logged without constructing a camp or additional log transfer facilities. There is potential for development of a trail system, and cabins or shelters. Because of the area's accessibility from Wrangell, there is potential for use of off-road vehicles and snowmobiles, and for cross-country skiing. Moose and deer winter range habitat improvement projects are planned in the area. The area generally has a low minerals rating and there are no known claims. Maintenance of the area in a roadless condition enhances opportunities for residents of the city of Wrangell who do not have a boat to have a semi-primitive recreation experience.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	1,720	9,900	0
B	0	1,720	9,900	0
C	0	11,620	0	0
D	480	1,240	9,900	0
E	0	11,620	0	0
F	0	11,620	0	0
G	0	11,620	0	0

Consequences

In Alternatives A and B, the area is mainly managed for semi-primitive recreation and retains its Wilderness potential. In Alternatives, C, E, F, and G, the area is managed for a moderate level of development including timber harvest, precluding Wilderness potential. In Alternative D, most of the area retains its Wilderness potential, except for small areas of intensive timber harvest around the perimeter.

(229) South Wrangell

Gross acres: 75,990

National Forest acres: 71,173

Description

The South Wrangell roadless area is located on Wrangell Island and is bounded on the east by Blake Channel, on the south by Ernest Sound, and on the west by Zimovia Strait. The northern boundary is defined by roads. The area is nearly bisected by a timber access road with its associated timber harvest, almost isolating the northwestern portion. A 138 KV powerline crosses the eastern and northeastern edges of the area. The area is generally characterized by moderately-diverse, rounded to occasionally blocky terrain, with broad, U-shaped valleys in-between. The area was inhabited by the Tlingit in prehistoric and historic times. Vegetation is typical southeast Alaska temperate rain forest. Important wildlife species include deer, wolves, black bear, marten, and small populations of brown bear and moose. Thoms Lake, Thoms Creek, and Thoms Place are all attractions, especially during the salmon run. Thoms Place and Thoms Lake were selected by the State, and Thoms Place is now a State Marine Park. The two recreation cabins in the area are both on State land, and there is a picnic area and trail at Long Lake.

Wilderness Potential

The natural integrity of the area has been impacted by the road bisecting the area and the powerline crossing the eastern and northeastern edges. Boats plying the waters surrounding the area may be visible from within parts of the area, but usually are not intrusive. There is a good opportunity for solitude within the area, especially after one has gone a short distance from the roads. Generally, a person camped or traveling inland is likely to see others only occasionally. The area provides primarily primitive non-motorized recreation opportunity.

Resources

The area contains 22,697 acres of tentatively suitable forest land. The potential for managing timber in this area is high, as roads could be extended from the existing system and the area could be logged without constructing a camp or additional log transfer facilities. There is potential for additional outfitter/guide permits, trails and cabins or shelters. There is also potential for use of off-road vehicles and snowmobiles. Moose and winter range habitat improvement projects are planned in the area. The area generally has a low minerals rating and there are no known current claims. The Sealaska Native Corporation has selected several small historic sites along the coast. Maintenance of the area or parts thereof in a roadless condition would enhance primitive recreation opportunities for those residents of Wrangell without boats. It would also enhance the opportunities for residents of Thoms Place to maintain their current lifestyles.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	9,900	42,320	18,960	0
B	15,480	36,740	18,960	0
C	46,220	23,620	1,340	0
D	63,450	6,700	1,020	0
E	46,220	23,620	1,340	0
F	46,220	23,620	1,340	0
G	46,220	23,620	1,340	0

Consequences

In Alternatives A and B an area of about 19,000 acres between Fools Inlet and Blake Channel is managed for semi-primitive recreation and retains a moderate potential as wilderness. In all of the other Alternatives the area is managed for a mix of moderate and intensive development activities including timber harvest, and none of the areaq retains its potential as wilderness. In Alternative D the entire area is managed for intensive development emphasizing harvest of timber on the suitable forest lands which are distributed throughout the area.

(231) Woronkofski

Gross acres: 9,773

National Forest acres: 9,773

Description

The Woronkofski roadless area is located on Woronkofski Island and is bounded on three sides by saltwater, however harvest activities have occurred in several places along the beach. Roads and cutting units which follow a drainage penetrating the roadless area define the northern boundary. The city of Wrangell is five miles to the northeast. The area is generally characterized by steeply rising mountains reaching elevations of over 2,000 feet. The island was apparently used by several groups of the Stikine Tlingit as a hunting and fishing area. Vegetation is typical southeast Alaska temperate rain forest. Important species include Sitka black-tailed deer and black bear. Attractions include Elephants Nose, a rocky feature on the north end of the island at the edge of the area. Several gold mine claims were made in 1900 in a cove near here, too. The saltwater bodies surrounding the island receive moderately heavy use by commercial and pleasure boats and the shoreline receives moderate recreation use. Some recreation use occurs on the road system, generally from residents of Wrangell who sometimes transport small motorcycles and all-terrain vehicles by boat for use here. There is some subsistence use in the area.

Wilderness Potential

Timber harvest activities are evident all around the island, and dominate the northern portion. The remaining core is the roadless area, but it has been penetrated by harvest and roads following a drainage. In other portions, natural integrity is high. There is a good opportunity for solitude within the area, especially after one has gone a short distance from the roads. The area provides primarily semi-primitive motorized recreation opportunity.

Resources

The area contains 3,545 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is high, as roads could be extended from the existing system and much of the area could be logged without constructing a camp or additional log transfer facilities. There is potential for additional outfitter and guide permits, developed trails, and cabins or shelters. There is also potential for use of off-road vehicles and snowmobiles. Wildlife improvement projects planned typically consist of thinning and planting. The area generally has a low minerals rating and there are no known current claims. Maintenance of the area in a roadless condition enhances opportunities for residents of Wrangell to have a semi-primitive recreation experience. There has been no formal support for or opposition to maintaining this area in a roadless condition.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	220	9,550	0
B	0	220	9,550	0
C	0	9,210	560	0
D	200	20	9,550	0
E	0	9,210	560	0
F	0	9,210	560	0
G	0	9,210	560	0

Consequences

In Alternatives A, and B the area remains unroaded and is managed for semi-primitive recreation, and retains its potential as Wilderness. In Alternative D, the area generally retains its potential as Wilderness although a small portion of the area is managed for timber harvest. In Alternatives C, E, F, and G, the entire area is managed for a mix of uses that includes development of roads and timber harvest activities emphasizing motorized recreation and visual quality, and the area does not retain a potential as Wilderness.

(232) North Etolin
Gross acres: 46,887
National Forest acres: 46,887

Description

The North Etolin roadless area is located on the north end of Etolin Island and is bounded by Stikine Strait, Zimovia Strait, and Anita Bay. The southern boundary has been logged and partially roaded, and a small area on the northeast side has also been harvested. Wrangell lies ten miles to the north. The area is generally characterized by steeply-rising mountains reaching elevations of over 3,000 feet. There is much landform variety, including a major drainage flowing to the south. The island was claimed by the Tansaqwedi and Xokedi clans of the Stikine Tlingit, as is evidenced by the remains of villages, fish camps, fort sites, petroglyphs and fish weirs. Vegetation is typical southeast Alaska temperate rain forest. Wildlife species include deer, black bear, and elk, which were introduced to the island in 1986 as a cooperative effort to establish elk in southeast Alaska. Survival so far has been described as marginal. Kunk Lake is a popular recreation destination accessible by trail. The area is primarily used for recreation by residents of Wrangell. The saltwater bodies surrounding the island receive moderately heavy use by commercial and pleasure boats. There is subsistence use in the area.

Wilderness Potential

Within the area the natural integrity is unmodified, except for the trail to Kunk Lake; however, timber harvest dominates the southern boundary. There is good opportunity for solitude within the area. Present recreation use levels are low except at the mouths of some streams and along the trail. The area provides primarily semi-primitive motorized and non-motorized, as well as primitive, recreation opportunities. Travel within the area is challenging, requiring a high degree of woods skills and experience. The presence of black bears, especially around salmon streams in the fall, presents a degree of challenge and a need for caution.

Resources

The area contains 17,188 acres of tentatively suitable forest land. The potential for managing timber is moderate, as roads could be extended from the existing system and much of the area could be logged without constructing a camp or additional log transfer facilities. There is potential for additional outfitter and guide permits, developed trails, and cabins or shelters. If the elk population grows, a harvest may occur at some point in the future. Deer range habitat improvement projects are planned in the area. There is generally a low minerals rating and no known current claims. Maintenance of the area in a roadless condition enhances opportunities for visitors to and residents of Wrangell to have a semi-primitive recreation experience.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,660	19,090	26,140	0
B	6,430	17,830	22,630	0
C	21,530	23,520	1,840	0
D	32,090	1,500	13,300	0
E	21,530	23,520	1,840	0
F	21,530	23,520	1,840	0
G	21,530	23,520	1,840	0

Consequences

In Alternative A most of the south and east portions of the area are managed for primitive recreation while the Kunk Lake area is managed for old growth habitat; This portion of the area retains a fairly high potential as Wilderness. In Alternative B most of the same areas are managed for primitive and semiprimitive recreation, although additional areas in the Kunk Lake drainage are intensively managed for timber harvest, greatly reducing the potential as Wilderness. In Alternatives C, E, F, and G, the majority of the area is managed for intensive development for timber harvest, and no potential as Wilderness remains. In Alternative D, a 13,000 acre core area, including Kunk Lake and creek are managed for primitive and semiprimitive recreation and retain a marginal potential for future consideration as Wilderness.

(233) Mosman

Gross acres: 57,974
National Forest acres: 57,974

Description

The Mosman roadless area is located in the middle of Etolin Island. It is bounded by Clarence Strait on the west, a roadless area to the south and east, and an area of roads and harvest units to the north. The area is generally characterized by a series of mountains oriented nearly in a north-south alignment, separated by the long, narrow waterways of Mosman and Burnett Bays. Major lakes in the area include Streets, Navy and Burnett Lakes. The city of Wrangell lies 22 miles to the north. This area was claimed by several Stikine Tlingit clans during prehistoric times as is evidenced by the remains of villages, camps, fish weirs, petroglyphs, and bark-stripped trees. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, black bear, and elk which were introduced on the island in 1986 as a cooperative project. The saltwater bodies surrounding the island receive moderately-heavy use by commercial and pleasure boats. The shoreline and bays receive light recreation use. Steamer Bay cabin is located in the northwest corner of the area. There is subsistence use in the area. There are five special use permits under authorizations, and lighthouse reservations.

Wilderness Potential

Within the roadless area the natural integrity is unmodified
except as noted above, but timber harvest activities dominate the northern boundary. There is a good opportunity for solitude within the area away from improvements and facilities. Present recreation use levels are low except at the mouths of some streams and at the cabin. The area provides primarily semi-primitive motorized and non-motorized recreation opportunities. Travel within the area is challenging, requiring a high degree of woods skills and experience. The long bays penetrate the area and provide access to portions of the interior, as well as protect users from the open waters and traffic of Clarence Strait.

Resources

The area contains 21,564 acres of tentatively suitable forest land. The potential for managing timber is moderate, as roads could be extended from the existing system, and much of the area could be logged without constructing a camp or additional log transfer facilities. There is potential for additional outfitter and guide permits, developed trails, and cabins or shelters. Elk hunting may be possible at some point in the future. Deer range habitat improvement projects are planned in the area. The area generally has a low minerals rating and there are no known current claims. Maintenance of the area in a roadless condition enhances opportunities for visitors to and residents of the city of Wrangell to have a semi-primitive recreation experience.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,940	36,420	19,610	0
B	3,530	34,840	19,610	0
C	1,680	48,990	7,300	0
D	53,060	1,960	2,950	0
E	1,680	48,990	7,300	0
F	1,680	48,990	7,300	0
G	1,680	48,990	7,300	0

Consequences

In Alternatives A and B about 20,000 acres remain undeveloped; however these areas are fragmented (generally around the perimeters of the bays and major lakes which attract recreation use) and are of insufficient size to be considered for Wilderness. In Alternatives C, E, F and G, the area is managed for a mix of uses including road accessible recreation and timber harvest, and non of the area retains potential as Wilderness. In Alternative D the entire area is managed with emphasis on economical timber harvest and all Wilderness potential is foregone.

(234) South Etolin

Gross acres: 113,031
National Forest acres: 113,031

Description

The South Etolin roadless area encompasses the southern end of Etolin Island. It is bounded by Clarence Strait, Mosman roadless area, and Ernest Sound. This area was proposed as Wilderness in during ANILCA but was not designated, and has since been managed to retain its Wilderness potential. The area is generally characterized by a series of rugged mountains, ridges, and glacial cirque lakes. Several large islands off the southern end of the island are included, plus numerous smaller islands in the vicinity. The area was inhabited by several clans of the Stikine Tlingit as is evidenced by the many cultural resource sites. Historic use of this area was also considerable and is represented by the remains of the first salmon hatchery in Alaska, canneries, fox farms, and other temporary camps. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, black bear, and elk which were introduced to the island in 1986 as a cooperative project. The saltwater bodies surrounding the island receive moderately-heavy use by commercial and pleasure boats. The shoreline and bays receive light recreation use. There is subsistence use in the area. Attractions include the landform variety, the bays which provide sheltered moorages, and the unique elk. Use of the area is mostly for recreation by residents of Wrangell.

Wilderness Potential

The area is unmodified, and has maintained its natural integrity. North of the area, it has been logged and partially roaded. There is a good opportunity for solitude within the area. Present recreation use levels are low except at the mouths of some streams and at good anchorages. The area provides primarily semi-primitive motorized and non-motorized recreation opportunity. Travel within the area is challenging, requiring a high degree of woods skills and experience.

Resources

The area contains 36,356 acres of tentatively suitable forest land. The potential for managing timber in this area is low due to the rugged nature of the terrain. An exception is in the southern portion where the potential is moderate due to the more gently sloping terrain. The area has been again proposed as Wilderness in pending Tongass legislation. There is potential for additional outfitter and guide permits, developed trails, and cabins or shelters. The elk population may offer a unique hunting experience in the future. Deer range habitat improvement projects are planned in the area. The area generally has a low minerals rating and there are no known current claims. Maintenance of the area in a roadless condition enhances opportunities for

visitors to and residents of Wrangell to have a semi-primitive recreation experience. The State has selected about 805 acres near McHenry Anchorage. There is support for maintaining this area in a roadless condition.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	15,260	14,960	82,810
B	12,400	8,960	91,670	0
C	29,400	480	83,150	0
D	99,770	2,260	11,000	0
E	29,380	480	360	82,810
F	29,400	480	83,150	0
G	29,400	480	83,150	0

Consequences

In Alternatives A and E all of the original area proposed as Wilderness during ANILCA debates are recommended for Wilderness designation. In Alternative A the remaining area is managed for a mix of uses, including management for old growth habitat, and an additional small area retains its potential as Wilderness. In Aaternative B this remaining area is managed for a mix of uses including intensive timber harvest and does not retain any Wilderness potential. In Alternatives C, F, and G all of the area recommended as Wilderness in Alternatives A and E are managed for primitive and semiprimitive recreation and retains its potential for future consideration as Wilderness. In Alternative D the majority of the area is managed for timber harvest and no Wilderness potential remains except for Onslow Island which is managed for semiprimitive recreation.

(235) West Zarembo

Gross acres: 6,945

National Forest acres: 6,945

Description

West Zarembo roadless area is located on the west side of Zarembo Island, south of Mitkof Island and 10 miles west of the town of Wrangell. Sumner Strait lies to the north, and Clarence Strait to the west, while clearcut harvest areas and reforested plantations are adjacent to the east. Some of the beachfront has been salvage-logged in the past. The area is generally flat and slightly rolling. Zarembo Island was evidently used by all of the Stikine Tlingit clans for hunting and gathering as is evidenced by several fish weirs and petroglyph sites along the west coast of the island. Vegetation is typical southeast Alaska temperate rain forest. A small population of deer and black bear range over the area. There are no developed recreation opportunities in the area. Recreational use is light in all of the roadless areas on the island, occurring mostly along the beach fringe, due in part to difficult access.

Wilderness Potential

The area is unmodified, however logging outside of the area, but within higher reaches of the drainage, may have altered some of the natural processes. This impact, however is considered low. There is a moderate opportunity for solitude within the area. Low-flying airplanes and recreational boaters may at times pass nearby, but generally a person camped or traveling inland is unlikely to see others. Periodic timber harvest activities in the adjacent areas would have a significant impact on the opportunity for solitude. The area provides primarily primitive non-motorized recreation opportunity.

Resources

The area contains 2,355 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on high market values. A road system is already present nearby and could be extended into parts of the area. A log transfer site to saltwater is already present on the island. There is potential for outfitter and guide permits, and for developed trails, cabins or shelters. Fish habitat enhancement projects for the two VCU's have been identified, as well as deer mitigation projects which are unlikely to occur within the roadless area. The area has moderate minerals potential. Maintenance of the area in a roadless condition enhances opportunities for wildlife to move freely through the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	4,910	940	1,100	0
B	5,810	40	1,100	0
C	6,530	380	40	0
D	6,050	340	560	0
E	6,530	380	40	0
F	6,530	380	40	0
G	6,530	380	40	0

Consequences

In all alternatives West Zarembo is primarily managed with an emphasis on the harvest of timber on suitable forest lands. No areas meeting the minimum criteria for consideration as Wilderness would remain undeveloped.

(236) East Zarembo

Gross acres: 8,990
National Forest acres: 8,990

Description

East Zarembo roadless area is located on the east side of Zarembo Island, south of Mitkof Island, and 10 miles west of Wrangell. Sumner Strait lies to the north, and Clarence Strait to the west. The terrain is generally rolling and there are about 140 acres of small ponds and lakes. Clearcut harvest areas and reforested plantations generally surround the whole area. Zarembo Island was shared by all of the Stikine Tlingit clans for hunting and gathering of subsistence items. There are, however, no sites currently recorded. Vegetation is typical southeast Alaska temperate rain forest. A small population of Sitka black-tailed deer and black bear range over the area. There is some subsistence use in the area. There are no developed recreation opportunities. Recreation use is light in all the roadless areas on the island, occurring mostly on the beach fringes.

Wilderness Potential

The area is unmodified. Logging outside of the area, but within higher reaches of the drainage, may have altered some of the natural processes. This impact, however, is considered low. There is a moderate opportunity for solitude within the area. Low-flying airplanes and recreational boaters may at times pass nearby. Periodic timber harvest activities in the adjacent areas would have a significant impact on the opportunity for solitude when they are occurring. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 2,937 acres of tentatively suitable forest land. The potential for managing timber is dependent on high market values. A road system is already present nearby and could be extended into parts of this area. A log transfer site is already present on the island. There is potential for outfitter and guide permits, and for developed trails, cabins or shelters. Fish habitat enhancement projects have been identified, but it is unlikely that they will occur. Deer mitigation projects are planned also for the area. The area has moderate minerals potential. Maintenance of the area in a roadless condition enhances opportunities for wildlife to move freely through the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	4,970	4,000	20	0
B	4,970	4,000	20	0
C	0	8,990	0	0
D	8,650	340	0	0
E	0	8,990	0	0
F	0	8,990	0	0
G	0	8,990	0	0

Consequences

In all Alternatives the majority of East Zarembo is managed with an emphasis on moderate or intensive development including timber harvest, and no areas remain undeveloped which would meet the minimum criteria for consideration as Wilderness.

(237) South Zarembo

Gross acres: 32,288
National Forest acres: 32,288

Description

South Zarembo roadless area is located on the south side of Zarembo Island, south of Mitkof Island, and 10 miles west of Wrangell. Sumner Strait lies to the north, Stikine Strait to the south, and Clarence Strait to the west. The terrain is moderately rolling and there are about 80 acres of small ponds and lakes. Clearcut harvest areas and reforested plantations generally surround the whole area, except for a small section of shoreline adjacent to Stikine Strait. Zarembo Island was shared by all of the Stikine Tlingit clans for hunting and gathering of subsistence items. There are remains of a village sites, burial sites, fish weirs, petroglyphs, and pictographs. Vegetation is typical southeast Alaska temperate rain forest. A small population of Sitka black-tailed deer and black bear range over the area. There is some subsistence use in the area. There are no developed recreation opportunities. Recreation use is light in all the roadless areas on the island, occurring mostly on the beach fringes.

Wilderness Potential

The area is unmodified. Logging outside of the area, but within higher reaches of the drainage, may have altered some of the natural processes. This impact, however, is considered low. There is a moderate opportunity for solitude within the area. Low-flying airplanes and recreational boaters may at times pass nearby. Periodic timber harvest activities in the adjacent areas would have a significant impact on the opportunity for solitude when they are occurring. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 10,333 acres of tentatively suitable forest land. The potential for managing timber is dependent on high market values. A road system is already present nearby and could be extended into parts of this area. A log transfer site is already present on the island. There is potential for outfitter and guide permits, and for developed trails, cabins or shelters. Fish habitat enhancement projects have been identified, as well as deer mitigation projects for the area. The area has moderate minerals potential. Maintenance of the area in a roadless condition enhances opportunities for wildlife to move freely through the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	2,820	27,550	1,920	0
B	15,600	14,770	1,920	0
C	14,880	15,720	680	0
D	30,870	1,400	20	0
E	14,880	16,720	680	0
F	14,880	16,720	680	0
G	14,880	16,720	680	0

Consequences In all alternatives, the area is managed for a mix of moderate and intensive development, not retaining any Wilderness potential.

(238) Kashevarof
Gross acres: 5,725
National Forest acres: 5,725

Description

The Kashevarof roadless area consists of a series of small islands located in Clarence Strait, between the southwest side of Zarembo Island and the northeast corner of Prince of Wales Island. Bush and Shrubby Islands are not included in this roadless area as they have been logged. The islands in this area have little relief and are flat to slightly rolling with a high point of 482 feet on one of the Blashke Islands. The Tihitan clan of the Stikine Tlingit claimed this area which was used chiefly for hunting seals and gathering seaweed. Their use is evidenced by the remains of temporary camps, fish weirs, and petroglyphs. Historic use is indicated by the remains of numerous fox farms, trapping cabins, and temporary camps. Vegetation is typical southeast Alaska temperate rain forest. A small population of Sitka black-tailed deer and black bear range over the area. No major resource activities have occurred in this area, but there is some subsistence use. Attractions include the numerous small islands and sheltered bays providing opportunities for discovery, day use activities, and anchorage. There are no developed recreation opportunities in the area. The island clusters easily lend themselves to be managed in an unroaded condition. Wilderness consideration is less feasible due to the amount of marine traffic in the area and activities in the adjacent areas.

Wilderness Potential

The area is unmodified, and has maintained its overall integrity. There is moderate opportunity for solitude within the area. Low-flying airplanes and frequent marine traffic pass nearby and may be observed. Present recreation use levels are low. Timber harvest or other periodic activities in the adjacent areas would have a significant impact on the opportunity for solitude when they are occurring. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 5,530 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on high market values. A road system and/or logging systems capable of harvesting the numerous small islands would be necessary. Development of beach access and log transfer sites would also be required. There is potential for outfitter and guide permits and for developed trails, cabins or shelters. There are four special use permits in the area, and a Coast Guard reservation. The area has low minerals potential. Maintenance of the area in a roadless condition enhances opportunities for certain wildlife, as some of the islands in this group have been logged and the timber stands converted for even-age management.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	5,725	0
B	0	0	5,725	0
C	5,525	0	200	0
D	5,080	0	645	0
E	5,525	0	200	0
F	5,525	0	200	0
G	5,525	0	200	0

Consequences

In Alternatives A and B the areas are managed for semi-primitive recreation and because they are islands would retain their Wilderness potential. In all other alternatives, the area is managed for timber development, losing its Wilderness potential.

(239) Keku

Gross acres: 12,146
National Forest acres: 12,126

Description

The Keku roadless area is located on the northern end of Kuiu Island and includes 1,483 acres of offshore islands. It is bordered by Security roadless area, Rocky Pass and Keku Strait. Several good anchorages are located in Saginaw Bay and Halleck Harbor which allow visitors to "boat camp" overnight. Landforms are characterized by gently-sloping to moderately steep hills that are abruptly broken by prominent limestone cliffs. Orientation of the landscape makes development of a road system challenging. The area was claimed by several clans of the Kake Tlingit and there is a rich assortment of cultural resources. In modern times, this area has been a contingency area of the APC Long-term Timber Sale contract since 1960. A logging camp was developed at nearby Rowan Bay and is still active with up to 130 seasonal occupants. Vegetation is typical southeast Alaska temperate rain forest. This area is highly rated for wildlife values. The area is popular for black bear hunting and King salmon fishing. There are no developed recreation facilities, and recreation use levels are low. Special features include fossil hunting in Halleck Harbor which directly adjoins the area.

Wilderness Potential

The area is essentially unmodified, except for some evidence of past occupancy, beach logging, and other logging and roading which has somewhat fragmented this area. Generally, there is a high opportunity for solitude in the area. Use of floatplanes and motorboats may disrupt visitors for brief periods, and visitors may be disturbed by logging when it occurs along the road to Saginaw Bay. The area provides primarily semi-primitive recreation opportunity.

Resources

The area contains 5,311 acres of tentatively suitable forest land. In general, long-term timber sales on Kuiu Island will result in further road development, thus increasing access to parts of the area. Recreation potential for Keku is moderate, as there is potential for additional outfitter and guide permits, cabins, and opportunities associated with roaded access. Both fish and wildlife habitat improvement projects have been identified for the area. There are no inventoried sites with high mineral development potential. One year-long residence special use permit exists in the head of Saginaw Bay. A former village site has been selected by Sealaska Corporation under ANCSA. Up to 5,000 acres have been selected in Saginaw Bay but are still pending. The State has selected lands in Security Bay. Both these selections overlap with this roadless area. Maintenance of the area in a roadless condition would have no direct beneficial effect on nearby roadless areas.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	3,050	6,310	2,770	0
B	9,160	120	2,850	0
C	11,140	320	660	0
D	10,580	240	1,300	0
E	11,140	320	660	0
F	11,140	320	660	0
G	11,140	320	660	0

Consequences

In all alternatives the majority of the area is managed for moderate to intensive development, including timber harvest, which precludes Wilderness potential. In Alternatives A, B, and D there are some very small areas of semi-primitive recreation management which do not qualify for Wilderness due to their fragmented and small nature.

(240) Security

Gross acres: 41,585

National Forest acres: 41,105

Description

The Security roadless area is located on the northwest side of Kuiu Island on Chatham Strait. The area is bordered by saltwater on three sides with the remaining portions being highly roaded and modified terrain. The area includes all of Security Bay, Washington Bay, and a portion of Rowan and Saginaw Bays. Washington Bay, on the west slope, has a secure anchorage, but the remaining coastline is rocky and open to a moderate energy shoreline. The coastal area is characterized by steep, heavily-dissected slopes, rocky beaches, and numerous streams cascading directly into saltwater. North Kuiu Island was claimed by several clans of the Kake Tlingit as is evidenced by the remains of various sites, petroglyphs and bark-stripped trees. Vegetation is typical southeast Alaska temperate rain forest. The salt chuck at the head of Security Bay is known for high quality waterfowl hunting, and black bear populations attract numerous hunters. Security Creek, Rowan Creek, and Browns Creek are primary contributors to fish production in Rowan and Security Bays. There are no developed recreation facilities. Traveling by boat in the area requires extended boating time in exposed waters, challenging the skills of even experienced skippers. Lack of cabins or commercial overnight facilities limits use by fly-in recreationists. A fish buying station is normally established in Security Bay each year. The State has selected land in Security Bay for a future marine park, which could increase use of the area if developed.

Wilderness Potential

The area is essentially unmodified, although some evidence of old fox farms and fish camps is present. There is a low opportunity for solitude within the area. Noise from logging trucks on the adjacent road can be heard during harvest, and floatplanes and motorboats may disrupt visitors for brief periods. The area provides primarily primitive and semi-primitive non-motorized recreation opportunity.

Resources

The area contains 15,849 acres of tentatively suitable forest land. Activities under the APC Long-Term Sale contract will increase road access into parts of this area, which is considered a contingency area. If a ferry route were established to Rowan or Saginaw Bays, a new array of recreation opportunities would open up. There is also potential for one or more cabins or shelters and additional outfitter and guide permits. Both fish and wildlife improvement projects are planned for the area. There are no inventoried areas with high mineral development potential. With the exception of the head of Security Bay, there has been little interest expressed in retaining the roadless character of this island.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	2,180	28,540	10,380	0
B	19,830	10,750	10,520	0
C	36,210	2,190	2,700	0
D	35,270	2,030	3,800	0
E	36,210	2,190	2,700	0
F	36,210	2,190	2,700	0
G	36,210	2,190	2,700	0

Consequences

In Alternatives A and B, the area along Security Bay is managed for semi-primitive recreation and retains its Wilderness potential. The remainder of the area is managed for a mix of moderate and intensive development, including timber harvest, thus precluding Wilderness potential. In all the other alternatives, the majority of the land is managed for intensive timber harvest, losing all potential for Wilderness.

(241) North Kuiu
Gross acres: 9,741
National Forest acres: 9,741

Description

The North Kuiu roadless area is located near the center of the northern portion of Kuiu Island and is completely surrounded by roads and timber management activities, some of which have impacted parts of the core of the area. The area is characterized by rolling terrain with drainages in all directions. The area was within the territory of the Kake Tlingit, however no cultural resources have been recorded. Vegetation is typical southeast Alaska temperate rain forest. A population of deer and black bear range over the area. There are no developed recreation opportunities in this area and overall use levels are low. Hunting is the primary recreation use, with some subsistence use occurring also. Use is concentrated along the road-accessible outside edges. Rowan Bay, a logging camp, is the only community on Kuiu Island and is connected to the road system.

Wilderness Potential

The area is unmodified, however its overall integrity is not considered pristine. The irregular shape of the area, patterns of adjacent timber management, and roading have impacted the area's natural integrity. There is a moderate opportunity for solitude within the area. Timber harvest or other activities in the adjacent areas, which occur periodically, would have a significant impact on the opportunity for solitude when they are occurring. The area provides semi-primitive recreation opportunity.

Resources

The area contains 6,514 acres of tentatively suitable forest land. The area is within the primary sale area for the APC long term sale. The Supplemental EIS for the 1986-90 APC long term sale approves 438 acres of harvest, affecting a major part of the north portion of this roadless area. A road system and/or logging systems capable of harvesting the area would be necessary. Nearby roads could be extended to accomplish much of this. There is some potential for outfitter and guide permits. There is also potential for some off-road vehicles to enter the roadless area. Wildlife habitat improvement projects are planned such as seeding, planting, and thinning for browse species. The area has low minerals potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	380	9,320	40	0
B	7,760	1,920	60	0
C	8,920	820	0	0
D	8,920	820	0	0
E	8,920	820	0	0
F	8,920	820	0	0
G	8,920	820	0	0

Consequences

In all of the alternatives, the area is managed for either moderate or intensive timber harvest, losing all Wilderness potential.

(242) Camden

Gross acres: 54,730

National Forest acres: 54,730

Description

The Camden roadless area is located on the northeast corner of Kuiu Island on both sides of Port Camden, and includes Kadake Bay and a portion of Three Mile Arm. Landforms along this area are characterized by gently-rolling hills that are typically short, extremely broken and benched, making development of a road system challenging. The coastline area represents a richly varied ecosystem. The isthmus area between Port Camden, Bay of Pillars, and Threemile Arm includes several naturally occurring springs, which adds diversity to the habitat. The Port Camden area was an important subsistence area for the Saqtunedi clan of the Kake Tlingit as is evidenced by the remains of a village, temporary camps, fish weirs, petroglyphs and bark-stripped trees. Vegetation is typical southeast Alaska temperate rain forest. Port Camden supports quality waterfowl hunting at the head of the bay, as well as quality habitat for black bear, fur bearers, marine mammals and bald eagle. Easily accessible by boat from Kake, it has a tradition of high subsistence use. The many creeks in the area support commercial and sport fishing. There is one cabin and two portage trails, which provide opportunities for canoeists and kayakers to access additional recreation areas.

Wilderness Potential

The area is essentially unmodified, but roading and timber harvesting adjacent to the west have likely had a small effect on the area's natural integrity. There is moderate to high opportunity for solitude within the Kadake Creek, Port Camden and isthmus areas. Floatplanes, motorboats and noise from logging trucks may disrupt visitors' solitude. The area provides primarily primitive and semi-primitive non-motorized recreation opportunity, but overall recreation use level is low.

Resources

The area contains 23,973 acres of tentatively suitable forest land. APC Long-Term Timber Sale activity on Kuiu Island may result in increased roading, which may provide additional access to parts of this area for timber activities. The 1986-90 Supplemental EIS for the APC long term sale approves the harvest of 2,408 acres along the north side of Threemile Arm and along the west shore of Port Camden. Previous attempts to road and develop a log transfer facility along the eastern side of Port Camden met with high public resistance. Recreation potential for the area is high, access being the primary limiting factor for increased recreation use. There is potential for additional cabins, outfitter and guide permits. Kayaking and canoeing are increasing in connection with the recent establishment of portage trails and a brochure on kayaking/canoeing opportunities in the area. Both fish and wildlife habitat improvement projects are planned. The site along the eastern shore of Port Camden, where fossils have been located, is an inventoried potential Research Natural Area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	19,230	14,380	20,970	0
B	31,140	2,510	21,070	0
C	45,910	1,860	6,960	0
D	39,610	1,540	13,580	0
E	45,770	1,860	6,960	0
F	45,910	1,860	6,960	0
G	45,910	1,860	6,960	0

Consequences

In all alternatives, approximately 5,000 acres on either side of the north end of Port Camden is Research Natural Area, but because of the split it does not qualify as Wilderness. In Alternatives A, B, and D an area on the southeast side of Port Camden is managed for primitive recreation, retaining its Wilderness potential. The remainder of the area is managed for a mix of moderate to intensive development, losing Wilderness potential. In alternatives C, E, F, and G, the majority of the area is managed for intensive timber development, losing its Wilderness potential.

(243) Rocky Pass

Gross acres: 79,556
National Forest acres: 78,976

Description

Rocky Pass roadless area lies east of the Camden roadless area on Kuiu Island, and west of the South Kupreanof roadless area on Kupreanof Island, encompassing the narrow and often shallow waterway called Rocky Pass which has scores of small islands and rocks. Landforms along this area are characterized by rolling to moderately steep hills, with short, extremely broken or benched slopes. Forest Road 6040 adjoins this area near the head of McNaughton Bay, connecting to Kake, approximately 15 miles away. The Keku Strait area was used by both the Kake and Kuiu Tlingit. Former sites include temporary camps, garden areas, fish weirs, and fort sites. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include bald eagle, large flocks of ducks and geese that migrate through in fall, and otter which use the small islands. Bear hunting and sport fishing in the many streams are popular activities throughout the area. A fish pass, two recreation cabins, a short trail and an offshore oyster farm are the only major management activities in the area. The State has selected 605 acres on High Island.

Wilderness Potential

The area is essentially unmodified, except for the items mentioned above. There is a high opportunity for solitude in the area. Use of floatplanes and powerboats may disrupt visitors for brief periods. Persons camped along the shore are generally unlikely to encounter another person, but might see or be visible to the occasional fishing boat. The area provides primarily primitive and semi-primitive recreation opportunities.

Resources

The area contains 28,356 acres of tentatively suitable forest land. APC Long-Term Timber Sale activity may result in increased roading of Kuiu Island, which may provide additional access to the Rocky Pass area. The area has been identified in pending Tongass legislation. Continued development of the road system south of Kake would parallel the area and could make future management of the area in primitive settings more challenging. Recreation potential for the area is high, as there are opportunities for additional recreation cabins, trails, and outfitter and guide permits. Deer mitigation habitat improvement projects are planned in the area. There are no inventoried areas with high mineral development potential. Residents of Kake have a cultural, traditional interest in the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,430	220	3,100	74,220
B	1,690	1,330	75,950	0
C	4,530	260	74,180	0
D	63,470	1,200	14,300	0
E	4,514	120	120	74,220
F	4,530	260	74,180	0
G	4,530	260	74,180	0

Consequences

In Alternatives A and E the area is managed as Wilderness. In Alternative D, the majority of the area is managed as intensive timber development, losing its potential for Wilderness. There are two narrow strips of land along Big John Bay and Hamilton which are managed for semi-primitive recreation which have only a moderate potential for Wilderness. In Alternatives C, F, and G, the majority of the area is managed for semi-primitive and primitive recreation, retaining its Wilderness potential.

(244) Bay of Pillars
Gross acres: 28,610
National Forest acres: 28,570

Description

The Bay of Pillars area is located on the west side of Kuiu Island bordering Chatham Strait. The Tebenkof Bay Wilderness adjoins to the south, and areas to the north have been heavily modified by past and present timber harvest. The area is characterized by a large, open bay with numerous small islands, and a large inner bay connected to the outer bay by a narrow, rocky, but navigable channel. The outer bay is subject to occasional strong wave action, but is generally accessible. Kutlaku Lake is a major feature accessed from the south arm of the inner bay. The area was claimed by the Kake Tlingit as is evidenced by remains of village and garden sites, and bark-stripped trees. A cannery operated at Pillar Bay from about 1930-50, and employed Native people from Kake and Port Camden. Vegetation is typical southeast Alaska temperate rain forest. Habitat for black bear, deer, furbearers, land birds and waterfowl is highly valued in the area. Subsistence users, mostly from Kake, harvest sockeye at the mouth of Katlaku Creek, and sport anglers are beginning to fish steelhead in Kwatahein Creek. There are no cabins, but there is a portage trail connecting the inner bay with Port Camden.

Wilderness Potential

The area is essentially unmodified, except for those items mentioned above. There is a high opportunity for solitude within the area. Use of floatplanes and powerboats, and noise from logging trucks on the adjacent road, may disrupt visitors' solitude briefly. The area provides primarily primitive and semi-primitive motorized recreation opportunities. Access by boat into the area requires extended boating time in exposed waters, and entering the inner bay requires boating skill and may present great risk.

Resources

The area contains 16,684 acres of tentatively suitable forest land. APC Long-Term Sale activity on Kuiu Island may increase road access on the island, and in particular to this area. The area has been proposed as Wilderness in pending Tongass legislation. There is a strong interest on the part of inhabitants of some local communities to retain the roadless character of unroaded parts of Kuiu Island. Recreation potential includes a trail corridor from saltwater to Kutlaku Lake, additional cabins and outfitter/guide permits. If a ferry route were established to Rowan Bay, it would open up other recreation opportunities. Deer habitat improvement projects are planned in the area. Two electronics sites are located adjacent to or just within the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	3,230	380	24,970
B	3,170	60	25,340	0
C	3,440	80	25,050	0
D	26,180	1,250	1,130	0
E	3,420	80	100	24,970
F	3,440	80	25,050	0
G	3,440	80	25,050	0

Consequences

In Alternatives, A and E the area is managed as Wilderness, except for a small area of moderate or intense development on the southern tip of Rowan Bay. In Alternative D, the majority of the area is managed for intensive timber development, precluding Wilderness potential. In Alternatives B, C, F, and G, the area is managed for primitive and semi-primitive recreation retaining its Wilderenss potential, except for a small area of intensive development on the southern tip of Rowan Bay.

(245) East Kuiu

Gross acres: 46,271
National Forest acres: 46,271

Description

The East Kuiu roadless area lies directly east of Tebenkof Bay Wilderness on Kuiu Island, and borders Keku Strait. To the north, road construction and timber harvesting have been extensive. Several good anchorages can be found in Reid, Alvin, and No Name Bays, as well as at the head of Seclusion Harbor. Landforms along this area are characterized by gently-rolling hills that are typically short, extremely broken and benched, making development of a road system challenging. The area was used by both the Kake and Kuiu Tlingits and sites include temporary camps, garden areas, fish weirs and petroglyphs. Vegetation is typical southeast Alaska temperate rain forest. Salt Lagoon-Seclusion Harbor has a unique combination of freshwater and saltwater, making it valuable habitat for waterfowl, black bear, furbearers, marine mammals and bald eagles. This is also true for estuarine habitat found in Alvin Bay, Reid Bay and at the head of Threemile Arm. Attractions to this area include the south-facing sand beaches in Reid and Alvin Bays, and the Alecks Creek portage trail which connects No Name Bay with the Tebenkof Wilderness. There is a total of four miles of improved trail in the area. Generally, the area does not produce large numbers of salmon, and sport fishing pressure is low.

Wilderness Potential

The majority of the area is essentially unmodified, although some evidence of past occupancy is present. There is a high opportunity for solitude in the area. Use of floatplanes and powerboats may disrupt visitors for brief periods. The area provides primarily primitive recreation opportunity; there are no developed recreation facilities.

Resources

The area contains 23,880 acres of tentatively suitable forest land. APC Long-Term Timber Sale activity on Kuiu Island may result in increased road development, which may increase access to portions of this area. The area has been identified for Wilderness consideration in pending Tongass legislation. Recreation potential for the area is moderate. There is potential for a recreation cabin site, and for additional outfitter and guide permits. There are no inventoried areas with high mineral development potential in the area. Residents of Point Baker/Port Protection use the area for subsistence crabbing and shellfish harvesting. There is a fair level of public resistance to developing a road system into No Name Bay, which is a proposed State land selection.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	540	3,860	180	41,690
B	29,680	2,180	14,410	0
C	35,670	1,780	8,830	0
D	41,240	1,900	3,130	0
E	4,300	100	200	41,670
F	33,550	1,740	10,980	0
G	33,550	1,740	10,980	0

Consequences

In Alternatives A and E, the area is managed for Wilderness. In Alternative D, the area is managed for intense timber harvest, losing its potential as Wilderness. In Alternative B, the majority of the area is managed for intensive development, losing its Wilderness potential. There are three fragmented areas of primitive recreation which would have only moderate potential for Wilderenss. In Alternatives F and G, there area is managed for intensive development, except for some island areas which are managed for primitive recreation, and would retain Wilderness potential.

(246) South Kuiu

Gross acres: 124,085

National Forest acres: 124,065

Description

South Kuiu is located on the southern third of Kuiu Island, directly south of Tebenkof Bay Wilderness. The area borders on Chatham and Sumner Straits, and includes many bays and deep inlets with good anchorages. Landforms are varied and show great relief. Gently-rolling hills contrast to the sharply rising, heavily dissected mountain slopes at the head of Port Malmesbury and Crowley Bight. Deep islets and broken terrain make development of a road system, which would interconnect bays and islets to a primary log transfer facility, challenging and infeasible. The area was claimed by the Kuiu Tlingit who eventually settled in Klawock. There are remains of villages, fish weirs, and petroglyphs. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include black bears, deer, furbearers and waterfowl. This large area has 34 ADF&G numbered salmon producing streams and is generally a good producer of anadromous fish. Two of the best known streams are at the head of Bear Harbor and Kell Bay. There are no developed recreation facilities, and only 1.5 miles of improved trail in the area. The prime attraction to the area is its proximity to Tebenkof Wilderness and the terrain which provide ample opportunity for isolated, undeveloped forms of recreation.

Wilderness Potential

The area is essentially unmodified, although there are the remains of some old fox farms, a cannery, and a Coast Guard station, and evidence of past beach logging. There is a high opportunity for solitude in the area. Use of floatplanes and powerboats may disrupt visitors for brief periods. The area provides primarily primitive and semi-primitive motorized recreation opportunity.

Resources

The area contains 54,469 acres of tentatively suitable forest land. APC Long-Term Sales activity on Kuiu Island may result in increased road development, which may increase access to individual bays of the area. The area has been identified as a "moratorium" area for consideration as a Wilderness in pending Tongass legislation. Recreation potential for the area is moderate. There is potential for additional outfitter and guide permits, trails, cabins and shelters. There is potential for fish habitat improvements, but none are planned. A special use permit exists for a waterline. There are no inventoried areas with high mineral development in the area. Residents of Point Baker/Port Protection use the area for subsistence crabbing and shellfish harvesting.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	200	80	123,780
B	30,740	51,860	41,460	0
C	38,330	68,570	17,160	0
D	104,850	3,990	15,230	0
E	120	120	40	123,780
F	38,330	68,570	17,160	0
G	38,330	68,570	17,160	0

Consequences

In Alternatives A and E, the area is managed for Wilderness. In Alternative B, the area around the head of Affleck Canal is managed for old-growth, retaining Wilderenss potential. The remainder of the area is managed for a mix of moderate and intensive timber development, not retaining Wilderness potential. In Alternatives C, F, and G, the majority of the area is managed for a mix of moderate and intensive development, not retaining Wilderness potential. In Alternative D, the majority of the area is managed for intensive development, including timber harvest, precluding it from Wilderness.

(301) Skagway-Juneau Icefield

Gross acres: 1,209,259

National Forest acres: 1,209,199

Description

The Skagway-Juneau Icefield roadless area is located on the Juneau mainland and is bordered by Canada, the Lynn Canal and the southern edge of the Juneau Icefield above the Taku River drainage. There are several major rivers in the area. Berner's Bay area is characterized by moderately-large streams whose deltas form a broad intertidal flat. A fish weir and tent camp site were recently authorized to ADF&G on the Berner's River. Past uses include many recreation ventures, research, and gold mining. For much of the area vegetation is not present in any form because of the Icefield. In areas that have been deglaciated, the land is in various stages of plant colonization, including lush alpine meadows, western hemlock/Sitka spruce forests, and some cottonwood. There are populations of black and brown bear, moose, mountain goat, wolf, wolverine, some migratory waterfowl, and bald eagle. There are no known threatened or endangered species, but peregrine falcon may migrate through. There are two recreation cabins and several trails provide direct access into the area. Special attractions include the Icefield, numerous glaciers and hanging waterfalls which offer unparalleled scenery and opportunities for mountaineering, skiing, ice and rock climbing, camping, and scenic viewing. Four Research Natural Areas have been identified because of the uniqueness and scientific values of the ecosystems represented. There is a variety of use in the area, including boating and kayaking, hunting, and flight-seeing or helicopter viewing.

Wilderness Potential

The area is generally unmodified and pristine except for two active mining claims in Berner's Bay area and occasional camps of the Juneau Icefield Research Project. There is a great opportunity for solitude depending on what part of the area one is in. The Icefield provides dramatic remoteness; along Lynn Canal there is air and water traffic; and within Berner's Bay there is much recreation activity. The area provides primarily primitive and pristine recreation opportunities.

Resources

The area contains 32,571 acres of tentatively suitable forest land. The potential for managing timber in this area is limited due to the Icefield and glaciers. The area in the immediate vicinity of Berner's Bay has been identified as a proposed Wilderness in pending Tongass legislation. There is unparalleled opportunity for dispersed recreation. Opportunities for both moose and swan habitat enhancement have been identified. There is the possibility of building a road to the "outside". Mineral potential is generally low, except in the Berner's Bay area where two mines have re-opened.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	580	1,168,620	39,860
B	140	440	1,208,480	0
C	160	2,620	1,206,280	0
D	2000	3,880	1,204,280	0
E	160	2,620	1,166,420	39,860
F	160	2,620	1,206,280	0
G	160	440	1,208,480	0

Consequences

Alternatives A and E recommend the Berner's Bay area (39,860 acres) as Wilderness. The area would be withdrawn from mineral entry. Alternatives B, C, F and G would manage the area for primitive and semiprimitive recreation and old-growth habitat. Its wilderness potential would essentially remain unchanged. Mineral entry opportunities in the Berner's Bay area are retained in these alternatives. Alternative D allocates some areas on the south side of Berner's Bay (Cowee and Davies Creeks) and small areas near Skagway to prescriptions that would allow intensive development for timber harvest causing some adverse effects on Wilderness potential in Berner's Bay. However, the overall natural integrity and potential for Wilderness in this large roadless area would remain high.

(302) Taku-Snettisham

Gross acres: 736,271

National Forest acres: 736,112

Description

The Taku-Snettisham roadless area is located along the Coast Range south of Juneau, from the Taku River corridor to the Tracy Arm-Fords Terror Wilderness' northern boundary. The area is bordered by Stephens Passage on the west with two major river inlets: Taku Inlet and Port Snettisham. It is mountainous with deep saltwater fiords, several glaciers, and six major freshwater lakes. The area's history is long and varied, dating from prehistoric Tlingit use. The glacial Taku River is significant for fish production on an international scale- primarily salmon. Snettisham Fish Hatchery is a major State fish hatchery adjacent to the area. Limestone Inlet has been designated a Research Natural Area and the Yehring Creek area is a potential Research Natural Area. A powerline authorized by the Forest Service which serves the City and Borough of Juneau parallels the shoreline from the Snettishma Power Plant north to Juneau. Vegetation primarily consists of typical spruce/hemlock forests. There are populations of moose, goat, brown and black bear, mink, marten, and beaver. There are 3 recreation cabins and several trails in the area. The majority of use occurs within one-quarter mile from the shoreline and is usually associated with boating, hunting, viewing scenery and wildlife, and fishing.

Wilderness Potential

The majority of the area appears to be untouched by human activity and there is high opportunity for solitude, except near the shoreline, and where boat traffic, flightseeing over the glaciers, and the Taku Lodge occur. The area provides primarily primitive recreation opportunity.

Resources

The area contains 71,884 acres of tentatively suitable forest land. There is potential for timber harvest activity primarily in the Gilbert Bay-Williams Cove area. A small portion of the area (Williams Cove) is included in the Chuck River proposed Wilderness in pending Tongass legislation. The area has unlimited primitive and semi-primitive recreation potential. Because of the rugged terrain, use is concentrated, but additional trails and cabins would disperse, and possibly increase, use of the area. Several moose and swan habitat improvement projects are planned for the future. Proposed State land selections include the Snettisham Hydroelectric project and reservoir area and a site near Dorothy Lake. There is the possibility of building a road from Juneau to the "outside". The area has been identified as having mineral development potential and there are several claims in the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	3,870	153,140	571,160	7,560
B	14,620	142,450	578,650	0
C	19,180	301,310	415,220	0
D	289,340	42,580	403,790	0
E	19,160	301,270	407,740	7,560
F	19,180	301,310	415,220	0
G	19,180	301,310	415,220	0

Consequences

Alternatives A and E include a small part of a proposed Wilderness area located near Williams Cove, precluding mineral entry. In all alternatives, from 60 to 80 percent of the area retains its roadless character. In Alternatives A and B, the areas near Port Snettisham are subject to a mix of moderate and intensive development. In Alternatives C, F, and G the areas surrounding Port Snettisham, the outlet of the Taku River and the Speel and Whiting River valleys are subject to moderate development including timber harvest. In Alternative D these same areas are subject to intensive development for timber harvest on all suitable forest land which can be economically harvested. Potential for Wilderness is retained only in the northern half of the area.

(303) Sullivan

Gross acres: 66,677
National Forest acres: 66,657

Description

The Sullivan roadless area is located on the west side of Lynn Canal and extends from the Forest boundary on the north to the Endicott River Wilderness boundary to the south. The western boundary abuts Glacier Bay National Park and Preserve. It includes Sullivan Island in Lynn Canal. The area is generally characterized by rugged, scoured terrain with large, vertical relief, but at two river mouths, the shoreline is flat and accessible. The four adjacent harvest units on Lynn Canal cut in the 1960's have revegetated so they are no longer a strong detraction. Any documented historical use of this area has been minimal. Native use was probably limited to some hunting and gathering. Vegetation is typical southeast Alaska coastal temperate rain forest, with frequent alluvial deposits supporting willow and alder. Mountain goats, moose, bear and wolves, mink and lynx, and some deer are the common wildlife species. There are no improved trails or recreation cabins in the area, but an airstrip is located adjacent to the area on an alluvial fan and receives use from hunters and occasional miners. A small parcel of private land is located on the southern tip of Sullivan Island. Primary use of the area is for hunting both moose and bear.

Wilderness Potential

The area has very good natural integrity as it is unmodified except for some small mining claims in the area. There is a high opportunity for solitude within the area, except along the shoreline where the sights and sounds of planes, ferries, boats or cruiseships may be heard, although Sullivan Island screens much of the water traffic. Some thinning is occurring on adjacent harvest units and some drilling may be occurring on some of the current mining claims. The area provides primarily pristine and semi-primitive recreation opportunities.

Resources

The area contains 11,547 acres of tentatively suitable forest land. Sullivan Island is proposed as wilderness in pending Tongass legislation. There is a possibility to develop public recreation cabins within the area, but because of the difficulty and cost of access, the potential remains low. Outfitter and guide services may be increased in the future, especially in relation to big game hunting. The potential remains low for fish enhancement projects within the area. The area generally has Priority Two and Three mineral development potential ratings. Numerous mining claims exist and two Plans of Operation have been submitted. Occasionally, the topic of building a road to Haines surfaces, and most potential proposals indicate the west side of Lynn Canal as the route of choice.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	8,480	54,190	3,980
B	200	39,950	26,510	0
C	240	64,360	2,060	0
D	240	0	66,420	0
E	240	61,072	1,360	3,980
F	240	64,360	2,060	0
G	240	64,360	2,060	0

Consequences

In Alternative A, Sullivan Island is recommended as Wilderness and the remainder of the area is managed for primitive and semi-primitive recreation and retention of visual quality. The entire area retains its potential as Wilderness. In Alternative B, Sullivan Island and the Chilkat Range are managed to maintain visual quality, and the coastal area is managed for semi-primitive recreation. The entire area retains its potential for Wilderness. In Alternative C, F, and G the area is managed for road accessible recreation and visual quality, while allowing timber harvest and road construction. Alternative D is managed for semi-primitive recreation and maintains is visual quality. In Alternative E, the area is managed the same as Alternatives C, F and G, except that Sullivan Island is recommended as Wilderness.

(304) Chilkat-West Lynn Canal

Gross acres: 211,517

National Forest acres: 207,277

Description

Chilkat-West Lynn Canal roadless area, characterized by the Chilkat Mountain Range which runs the entire north-south length of it, is bounded by the Endicott River Wilderness to the north and Glacier Bay National Park and Preserve to the west. Icy Strait into Excursion Inlet borders the southern tip of the area, where there are some small islands and documented prehistoric Tlingit sites. There are some State selected or private parcels in St. James Bay and at the north end of Excursion Inlet. Alascom has a special use permit for a repeater station in William Henry Bay. The complexities of alpine tundra, scrub and old-growth forest, numerous small lakes, snowfields, steeply-walled glacial valleys and waterfalls are all special attractions of the area. As there are no improved trails or recreation cabins, recreation activities remain primarily dispersed and along the coastline. Moose and black bear hunting are increasing in popularity. Vegetation is typical coastal southeast Alaska temperate rain forest. The area commonly supports goats, black and brown bear, deer, bald eagles, wolves, and moose. Sea mammal rookeries are found throughout the area and many streams support runs of Dolly Varden, steelhead and cutthroat trout.

Wilderness Potential

The roadless area is unmodified and, therefore maintains the natural integrity well. There is a high opportunity for solitude within the interior, but the element of solitude is affected along the shore because of the substantial boating activities and flight corridors. Popular commercial fishing grounds are adjacent to the southern portion of this area. The possible Couverden timber sale adjacent to the area may affect the area in terms of noise and visual impacts. Recreation opportunities consist primarily of primitive and semi-primitive, non-motorized activities.

Resources

The area contains 46,896 acres of tentatively suitable forest land. There is great potential to provide a variety of recreation opportunities within this area. The rugged interior offers the hiker, backpacker, and mountaineer a high degree of challenge. All-weather anchorages and interesting coves and beaches offer excellent opportunities for beachcombing, camping and picnicking. Generally, the area has low mineral potential, but there are numerous known current claims. One site in the lower Endicott River area has been identified as an inventoried potential Research Natural Area. Periodically the idea of a proposed highway north to Haines surfaces. If one were to be built, this roadless area would be one logical route. As populations rise in nearby communities, use of this area will undoubtedly increase.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,200	144,740	64,340	0
B	1,240	144,700	64,340	0
C	40	156,620	53,620	0
D	7,260	133,510	69,510	0
E	40	156,620	53,620	0
F	40	156,620	53,620	0
G	40	156,620	53,620	0

Consequences

In all alternatives about 60% of the roadless area, from St. James Bay south, is managed for a mix of uses including road accessible recreation and visual quality, while allowing timber harvest and road construction. Potential for Wilderness in this portion of the area would be eliminated. Most of the area north of St. James Bay is managed for primitive and semi-primitive recreation and would retain its potential for Wilderness, except that in Alternative D about 6,000 acres adjacent to St. James Bay are managed for timber harvest.

(305) Juneau Urban

Gross acres: 105,669
National Forest acres: 104,970

Description

The Juneau Urban roadless area is located on the Juneau mainland and includes land from Echo Bay, north to City and Borough of Juneau land boundaries, and south to the Lemon Creek area. Glaciers and icefalls, combined with the surrounding ridges of over 3,000-4,000 feet, are the most dramatic features of the area. Tlingit Natives lived in the area long before the Gold Rush days which began in 1880 and spurred the rapid establishment of Juneau. Glacier Highway runs generally north to south and provides easy access to this entire area. There are numerous trails and two popular recreations cabins in the area. The Mendenhall Glacier Recreation Area and a large campground are within and adjacent to the area. There are many special use permits associated with outfitters and guides, including helicopter landing tours on the Icefield. Vegetation is typical southeast Alaska temperate rain forest. There are populations of mountain goats, furbearers, black and brown bear, and numerous waterfowl and upland birds, however deer populations are impacted because of severe winter conditions and generally high predator populations. Most of the local use is for recreation, including hunting, excellent fishing, and activities in support of tourism. There is local interest and concern regarding availability of firewood.

Wilderness Potential

The area is modified by cabins, trails, and mining claims.
In addition, regular air traffic, flightseeing tours, and helicopter landing tours all contribute to impacting the ecological processes in the area. There is not a high opportunity for solitude in this area for the previous reasons, plus noise from the Juneau road system. The area provides primarily primitive and semi-primitive non-motorized recreation opportunity.

Resources

The area contains 32,153 acres of tentatively suitable forest land. Timber sales within this area would be controversial because of its close proximity to Juneau and the high recreation use of the area. Interest is high regarding any management decisions made for this area. Recreation potential is seemingly infinite, including both developed and dispersed projects. Several fish habitat improvement projects have been identified, as well as several waterfowl habitat improvement projects. This area encompasses much of what is known as the Juneau Gold Belt and is recognized as an area of high mineral development potential, priority one. Recently, there has been renewed interest in mineral exploration. A parcel of 48 acres has been recently selected by the State in the Eagle River area, and a larger parcel has been proposed. The Auke Cape/Lena Cove parcel of 653 acres is also under consideration.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	360	98,520	6,090
B	0	16,060	89,910	0
C	0	35,990	68,980	0
D	2,600	20,980	81,400	0
E	0	29,900	68,980	6,090
F	0	29,900	75,070	0
G	0	30,820	74,150	0

Consequences

In Alternatives A and E, 6,090 acres are recommended as proposed Wilderness in the Berner's Bay area, precluding mineral entry. In all alternatives, the majority of the area is managed for semi-primitive recreation and retains its Wilderness potential, with the exception of an area south of Berner's Bay varying in size from 15,480 acres to 20,120 acres, which is managed for moderate and intensive development. All alternatives, except Alternative A, encourage potential mineral development in the majority of the area which could reduce the potential for Wilderness.

(306) Mansfield Peninsula

Gross acres: 53,054
National Forest acres: 52,994

Description

The Mansfield Peninsula roadless area is located on Mansfield Peninsula which is the northern most portion of Admiralty Island. It is surrounded by Stephens Passage to the east and Lynn Canal/Chatham Strait to the west. The southern boundary is adjacent to the road recently constructed from Young Bay to Green's Creek Mine. Several excellent anchorages are found adjacent to the peninsula, including Funter Bay, Hawk Inlet, and Barlow Cove. Native use of the area focused on fishing and hunting. Vegetation is typical southeast Alaska temperate rainforest. There is a large population of brown bear as well as Sitka black-tailed deer. Smaller animals include furbearers such as mink, marten, and beaver. Approximately 10-13 isolated hunter or recreation residence cabins are under special use permit in this area with minor trails for access, but no public recreation cabins exist. Primary attractions include good anchorages, and high-quality hunting and fishing opportunities in a location easily accessible by private boats, planes or helicopters from the capital city of Juneau.

Wilderness Potential

The area has been modified by mining claims, and access routes to these claims, for many years altering the natural integrity of the area. There is not a high opportunity for solitude within the area because of the numerous floatplanes, helicopters, boats, ferries, and cruiseships traveling to, near, or over this peninsula. There are primarily semi-primitive non-motorized recreation opportunities in the area.

Resources

The area contains 23,324 acres of tentatively suitable forest land. The area generally has a priority one high mineral development potential rating. Active mining claims and associated patented land are found here to a large extent. Recreation potential for this peninsula is moderately high because of its close proximity to a large population center. Public recreation cabins that can be accessed by saltwater are desired. Heli-hiking opportunities in the alpine may become more popular. A parcel at Hawk Inlet was nominated but not recommended for State selection, as was a parcel near Young Bay. A parcel at Funter Bay has been proposed as well as a parcel on the east side of the peninsula south of Colt Island. To date, no conveyances have taken place.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	5,980	16,080	30,880	0
B	5,980	16,080	30,880	0
C	0	47,670	5,270	0
D	21,130	14,680	17,130	0
E	0	47,670	5,270	0
F	0	47,670	5,270	0
G	0	35,940	16,990	0

Consequences

In Alternatives A and B, the southern half of Mansfield Peninsula is managed for primitive and semi-primitive recreation and retains its potential as Wilderness. The northern half is managed for a mix of moderate and intensive development including timber harvest. In Alternatives C, E, F, and G the entire roadless area is managed for a mix of development activities including road accessible recreation and visual quality, while allowing timber harvest. Wilderness potential would be eliminated. In Alternative D, 60% of the area is managed for moderate and intensive development, including timber harvest. The remaining undeveloped areas around Funter Bay and along the shoreline facing Juneau would be too small and fragmented to recommend as Wilderness. In all alternatives, the entire area remains open to mineral entry.

(307) Greens Creek

Gross acres: 48,917
National Forest acres: 48,078

Description

The Greens Creek roadless area is located on Admiralty Island and is directly north of Admiralty Island National Monument Wilderness. The northern boundary is formed by the access road to Greens Creek Mine (located in VCU 144) that traverses Mansfield Peninsula from Young Bay to Hawk Inlet. VCU 144 is designated Non-Wilderness National Monument Lands, LUD 1, with 16,710 acres. Young Bay Experimental Forest is located in VCU 133. Historically, Tlingit clans used the area as a seasonal subsistence procurement area, and seasonal camps and at least one village site have been noted. Remains of other historical buildings can still be seen. Three recreation cabins, a trail, and high-quality fishing opportunities in the streams and lakes attract considerable use from the Juneau area. Vegetation is typical southeast Alaska temperate rain forest. Important populations of wildlife in the area are brown bear, deer, bald eagles, waterfowl/shorebirds, and furbearers such as mink, marten, otter, and beaver. Although there are no known threatened or endangered species, two species of peregrine falcon may migrate through.

Wilderness Potential

The area appears modified to some extent due to the cabins, trail, mining operations, and past historic activities which are all visible. Opportunities for solitude vary depending upon one's location. Away from the developed facilities or shorelines, much of the area is not accessible by boat or floatplane, and the opportunity for solitude increases dramatically. The area provides primarily a semi-primitive non-motorized recreation opportunity.

Resources

The area contains 15,472 acres of tentatively suitable forest land. A portion of this area, primarily around Young Bay/Admiralty Cove, has been identified as proposed Wilderness in pending Tongass legislation. The area has been recognized for the numerous recreation opportunities and potential it provides, such as construction of a water-trail or National Recreation Trail, and public recreation cabins. The area generally has a high mineral development potential, priority-one minerals rating, in the vicinity of Greens Creek mine. The State had nominated 841 acres near Young Bay for selection but did not propose selection. This is because State ownership would be perceived as a conflict with the Greens Creek Mine non-development concept for the Hawk Inlet and Young Bay areas. This non-development concept is to last thirty years, the expected life of the mine.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	7,350	4,940	35,830
B	0	7,250	23,420	0
C	0	29,190	1,480	0
D	1,060	7,110	22,500	0
E	0	11,930	360	35,830
F	0	11,930	18,740	0
G	0	11,930	18,740	0

Consequences

In all alternatives, 6,000 acres are managed as the Young Bay experimental forest and that portion of the area within Admiralty National Monument remains undeveloped subject to the approved operation of Greens Creek Mine. In Alternative A, the Hawk Inlet area is managed for roaded and semi-primitive recreation, generally retaining its natural character except for the Greens Creek access road. The Admiralty Creek drainage is recommended as Wilderness. Alternative B is the same as Alternative A, except that the Admiralty Creek drainage is managed as old-growth habitat with no development. Alternative C manages Hawk Inlet and Admiralty Creek drainage for a mix of uses including timber harvest and road construction. Alternative D manages Hawk Inlet and the Admiralty Creek drainage for semi-primitive recreation and retains its Wilderness potential. Alternative E manages Hawk Inlet for a mix uses including timber harvest and road construction. The Admiralty Creek drainage is recommended as Wilderness. Alternative F and G are the same as Alternative E, except that the Admiralty Creek drainage is managed without timber harvest.

(308) Windham-Port Houghton

Gross acres: 240,777

National Forest acres: 240,296

Description

The Windham-Port Houghton roadless area is located directly south of Tracy Arm-Fords Terror Wilderness and is bordered to the west by Stephens Passage. The southern and eastern boundaries lie along the administrative boundary between the Chatham and Stikine Areas of the Tongass National Forest. Parts of four VCUs in the area are Native land selections at Hobart Bay. The topography of the area is typical of glaciated valleys in southeast Alaska. Hobart Bay is being actively logged presently by Goldbelt, Inc. There is evidence that portions of this area have been used since prehistoric times, including petroglyphs in Windham Bay. In more recent history, evidence of small homesteads, logging, mining, and fox farms from the 1800's to early 1900's can still be found. Vegetation is typical southeast Alaska temperate rain forest. The area supports a rich wildlife population, including black and brown bear, moose, deer, wolves, mountain goats, mink, marten, and beaver. There are two minor trails in the area, but no public recreation cabins. Most use of the area is located near saltwater or major creeks and is associated with commercial and sport fishing, hunting, beachcombing, mining, and crabbing.

Wilderness Potential

The area itself is unmodified, except for the abandoned fox farms, cabins, and upland mining claims. There are vast opportunities for solitude within a large portion of the area, except in the immediate vicinity of Hobart Bay. There is no regular air traffic into or over the area. The area provides primarily pristine and semi-primitive non-motorized recreation opportunities.

Resources

The area contains 113,789 acres of tentatively suitable forest land. The potential for harvesting timber in this area is good. A large portion of the area has been proposed proposed as Wilderness in pending Tongass legislation in two areas, Chuck River and Port Houghton-Sanborn Canal. Recreation potential focuses primarily on primitive and semi-primitive opportunities. There is potential for developed recreation, but because of the distance from any population center, use may be low. One fish habitat improvement project in Port Houghton has been identified. Portions of this area, especially in the Windham Bay area, are considered to have high mineral development potential, priority three. There are known current claims near Endicott Arm and Windham Bay and significant mining occurred in the 1880's. There are 481 acres of private land within the area, primarily located in Dry Bay.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	11,150	33,700	22,370	173,080
B	43,780	33,990	162,530	0
C	150,820	71,060	18,420	0
D	135,000	8,400	96,900	0
E	56,770	9,850	600	173,080
F	111,510	51,980	76,800	0
G	145,680	59,690	34,920	0

Consequences

In Alternatives A and E, 80% of the area is recommended as Wilderness. The areas south of Hobart Bay and Cape Fanshaw are managed for a mix of uses including semi-primitive recreation and timber harvest; however, the areas are fragmented and don't retain potential as Wilderness. In Alternative B, about half of the area facing the ocean in Stevens Passage and Frederick Sound are subject to development. Only the areas adjacent to Tracy Arm Wilderness and Port Houghton retain their potential for Wilderness. In Alternative C, the majority of the area is managed for timber production and does not retain any potential for Wilderness. In Alternative D, much of the area except for Port Houghton, is managed for intensive timber production. About 40% of the area retains its Wilderness potential. In Alternative E, the portions of the area not recommended for Wilderness are managed mostly for timber development. In Alternative F, the areas along the Endicott Arm and the Chuck River drainage are managed for no timber harvest and retain their potential for Wilderness. In Alternative G, the area north of Windham Bay along Endicott Arm is managed for no timber harvest and would retain its potential for Wilderness. The remainder of the area is managed for moderate and intensive development and does not retain its Wilderness potential.

(309) Juneau Islands

Gross acres: 7,190
National Forest acres: 7,051

Description

The Juneau Islands roadless area is comprised of the small, low-lying islands, with no significant geologic features, directly adjacent to the City and Borough of Juneau urban area in Lynn Canal and Auke Bay. The primary islands are Shelter Island, Lincoln Island, Benjamin Island, Coghlan Island, Portland Island, and Spuhn Island. The Tlingit Natives lived in the area before the Gold Rush of the 1890's. Many of the islands contained fox farms earlier in this century. Currently these islands receive heavy recreational use due to their proximity to and easy access from Juneau, usually by boat or kayak. There are no improved trails on the island or public recreation cabins, but Portland Island has a popular dispersed picnic ground (with mooring buoy) and a youth wilderness camp, organized through the City and Borough of Juneau. Vegetation is typical southeast Alaska temperate rain forest. Sitka black-tailed deer are found on these islands as well as small furbearers such as mink and marten.

Wilderness Potential

The islands in this area have been modified throughout the years by the activities occurring on them, which have compromised their natural integrity. Lynn Canal and Auke Bay are both extremely busy waterways, with cruiseships, ferries, and private and commercial boats using them regularly. The sights and sounds of air traffic and the nearby urban area are also noticeable from these islands. Roaded natural and semi-primitive non-motorized recreation opportunities are primarily provided.

Resources

The area contains 3,787 acres of tentatively suitable forest land, although the potential for managing timber in this roadless area is low. There is great potential for increased recreation opportunities, and for this reason, the State has proposed selection of all these islands for State acquisition. The southern tip and a portion of the northern tip of Shelter Island are privately owned. The area generally has a low minerals potential and there are no known current claims. The area has no significant fire history, although very small, human-caused fires occur occasionally throughout the summer months.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	6,850	0
B	0	120	6,730	0
C	0	120	6,730	0
D	0	2,550	4,310	0
E	0	120	6,730	0
F	0	120	6,730	0
G	0	120	6,730	0

Consequences

In all alternatives, these islands are managed for primitive or semi-primitive recreation and would retain their potential for Wilderness.

(310) Douglas Island

Gross acres: 27,430

National Forest acres: 27,390

Description

The Douglas Island roadless area is located on a portion of Douglas Island located directly across Gastineau Channel from Juneau. City and Borough of Juneau lands border this area on all sides except to the west, along the coast, which is Native-selected land. The City and Borough-managed ski area is located directly in the center of this roadless area which is accessed by Eagle Crest Road. The history of the area is tied to Juneau since the Gold Rush days and some historical remains still exist. The area is typical southeast Alaska temperate rain forest, with some areas above treeline but no permanent snowfields or lakes. There are some black bear, Sitka black-tailed deer, marten, mink and ermine. Two trails are included in the area and one recreation cabin which is popular year-round. The area, with its immediate proximity to Juneau and Douglas, receives heavy use for hunting, hiking, scenery viewing, camping, climbing, cross-country skiing, and snowmobiling.

Wilderness Potential

The roadless area is essentially unmodified except in the area of the trails and cabin, but the close proximity to roads and to an urban environment affect its natural integrity as does the presence of the developed ski area in the core of the island. Due to all the urban, recreational, air and boat traffic, there is little opportunity for solitude, especially on the northeast side of the island facing the urban area. There are primarily semi-primitive recreation opportunities available.

Resources

The area contains 9,696 acres of tentatively suitable forest land. The potential for managing timber in this area is poor because of the extensive alpine/muskeg environment and lack of appropriate timber to make such activity financially feasible. Also, its close proximity to Juneau would most likely create controversy over such actions. There is high interest in providing recreational opportunities, on this area and Douglas Island as a whole, for the community of Juneau. Winter sports and recreation cabin use are important to local residents, with the easily-accessible alpine environment a primary attractor. A trail/hut system in conjunction with a trail circumnavigating Douglas Island has been under discussion. The island has been identified as an area of potential mineral development. Currently, there are several claims in the southwest portion of the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	4,040	23,350	0
B	0	4,040	23,350	0
C	0	5,380	22,010	0
D	4,380	220	22,790	0
E	0	5,380	22,010	0
F	0	5,380	22,010	0
G	0	5,380	22,010	0

Consequences

In all alternatives, the northern three-quarters of Douglas Island is managed for semi-primitive recreation and retains its potential for Wilderness. About 4,000 acres on the southwest portion of the island is managed for timber harvest and would not retain its Wilderness potential.

(311) Chichagof

Gross acres: 969,439

National Forest acres: 637,238

Description

The Chichagof roadless area is located on Chichagof Island, and includes the Lemesurier and Inian Island groups. The boundaries of this very mountainous area are extremely uneven, but it includes most of the central portion of Chichagof Island. There are many creeks and rivers, lakes, bays and fiords, saltwater estuaries, and a rocky shoreline. The towns of Pelican on Lisianski Inlet and Elfin Cove at Port Althorp and two logging camps are encompassed by the area. The area is rich in history, including historic and prehistoric Native sites, use by John Muir, exploration by Captain Vancouver, and fishing and homesteading use. Vegetation is typical southeast Alaska temperate rain forest. Wildlife in the area include brown bear, deer, marten, red squirrel, bald eagle, waterfowl, and seal. The Peale's peregrine falcon migrates through the forest, and humpback whales inhabit nearby waters. There are no recreation cabins in the area, but two trails exist. There is a wide variety of recreation use of the area, including hiking, camping, kayaking, fishing, hunting, boating, etc. There are 11 special use permits, a shelter at Little Saltery Bay, a hunter's cabin at Crab Bay, and 20 unpatented mining claims. Special features include all the above attractions, hot springs at Hoonah Sound, and marble formations at Basket Bay.

Wilderness Potential

The area is unmodified except for isolated areas. Adjacent
nearby areas have been heavily modified from roading, logging, mining, and communities, but have not had a significant influence on the overall area. The opportunity for solitude is very high, enhanced by the the proximity to the West Chichagof-Yakobi Wilderness, however logging on the adjacent Huna Totem and Sealaska private lands for the next three years will adversely affect solitude. Regular and charter airflights over the area occur, but are transitory and short term in nature. The area provides primarily primitive and semi-primitive non-motorized opportunities, but it is evident that vehicles do use the area.

Resources Potential

The area contains 150,060 acres of tentatively suitable
forest land. The area is included in the Alaska Pulp Corporation long-term timber sale contract area and some of the harvest units will be in the roadless area, accessed by existing roads. The Supplemental EIS for the 1986-90 APC long term sale approved harvest of 2,688 acres with access from the Corner Bay, False Island and Sitkoh Bay road systems in the east portion of the roadless area. A large portion of the area has been proposed as wilderness in pending Tongass legislation. There is very high recreation

potential, and many trail and cabin projects have been identified, as well as two wildlife habitat management projects. The area is highly rated for salmon production. There are two inventoried potential Research Natural Areas, located at Upper Tenakee Inlet Hot Springs and Tonalite Creek. Portions of the area have a high potential for development of locatable minerals; several mining operations are currently in operation. Subsistence use take place throughout most of the area and includes hunting, fishing, and gathering. Each community has its own emphasis issues, ranging from environmental protection to sustaining harvest for job protection and economic concerns.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	26,050	88,330	152,980	366,940
B	95,210	91,710	446,710	0
C	297,510	196,250	139,860	0
D	351,240	23,780	268,600	0
E	197,780	45,490	24,100	366,260
F	210,660	139,400	283,570	0
G	221,290	129,220	283,110	0

Consequences

In Alternative A, 366,940 acres are recommended for Wilderness including the north side of Hoonah Sound, most of central Chichigof, north Chichigof along Icy Strait, and Inian and Lemesurier Islands. About 20% of the area is managed for development activities, including the north side of Lisianski Inlet and around Crab Bay. Overall the area retains a high potential as Wilderness. In Alternative B, most of the area around upper Tenakee Inlet and between Hoonah Sound and Tenakee Inlet is managed for development.

The Kadashan drainage is managed for old-growth habitat and no development. The remaining roadless area is divided into four separate areas which, due to their size, retain a high potential for Wilderness. In Alternative C, only two relatively small areas around Seal Bay and Idaho Inlet retain their potential for Wilderness. The remainder of the area is subject to mainly intensive timber harvest. In Alternative D, only the areas around upper Lisianski Inlet, between Neka Bay and Mud Bay, and Idaho Inlet are managed for semi-primitive and primitive recreation and retain potential for Wilderness. All of the remaining area is managed for intensive timber development and do not retain potential as Wilderness. In Alternative, the recommended Wilderness is identical to Alternative A; however, most of the remaining area is managed intensively for timber production. In Alternative F, about half of the area, from Hoonah Sound to Lisianski Inlet, and the Kadashan River drainage are managed for no timber harvest and retain its Wilderness potential. In addition to these area, the area around Idaho Inlet and Seal Bay are managed for semi-primitive recreation and remain undeveloped. In Alternative G, about half of the area is managed for primitive and semi-primitive recreation and retains its Wilderness potential. However, two-thirds of the Kadashan River drainage are managed for road accessible recreation and timber harvest, and its potential for Wilderness is forgone.

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(312) Trap Bay

Gross acres: 22,028

National Forest acres: 22,008

Description

The Trap Bay roadless area, having four well-defined ridge systems and three large drainages, is located on the east side of Chichagof Island. Tenakee Inlet forms the northern boundary, and Chatham Strait borders on the east. Much of the land boundaries are timber harvest areas. Saltwater bays and estuaries are numerous and exhibit much variety. Hoonah and Angoon Tlingit villages and sites for seasonal hunting, fishing, and collecting activities were located throughout the area. Tenakee Springs and the Corner Bay logging camp are nearby logging communities. Fishing, especially for salmon, is a major, resident subsistence activity. Sport and commercial fishing in area waters is common. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include brown bear, deer, marten, mink, otter, bald eagles, and a few bird species. The American peregrine falcon migrates through and humpback whale inhabit nearby waters. There are two federal and one State research cabins in the Trap Bay area, but no recreation cabins in the area. There is one special use permit in VCU 238 for an electronic site. There are a number of outfitters and guides with special use permits operating. Special features include Trap Mountain plus the spectacular autumn colors in the alpine zone. Local uses include hunting, hiking, fishing, and boating.

Wilderness Potential

Other than the areas adjacent to timber harvest activities,
the area appears natural and unmodified. There is a moderate opportunity for solitude around the shorelines because of the constant activities of the Corner Bay logging camp and Tenakee Springs. Boats and small planes use this area regularly. Due to lack of access and use, the interior would provide greater solitude. Much of the area provides semi-primitive non-motorized recreation opportunities.

Resources

The area contains 10,074 acres of tentatively suitable forest land. The entire area is located within the Alaska Pulp Corporation long term timber sale contract area. The potential for managing timber is high as there are large areas with operable timber and access roads, making timber harvest economical. The Supplemental EIS for the 1986-90 operating period for the APC long term sale approved harvest of 1,051 arres in the Trap Bay and Basket Bay areas; these harvest units eliminate the wilderness potential in the east half of the roadless area. The area includes proposed wilderness at Trap Bay in pending Tongass legislation. There are recreation opportunities at Sitkoh and Kook Lakes, including trails. There is potential for the introduction of mountain goats in the Trap Bay Mountain area and on the adjoining ridge systems. Mineral development potential is low. Local issues include environmental and economic concerns.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	60	12,800	2,590	6,560
B	1,580	11,290	9,150	0
C	16,240	4,750	1,020	0
D	15,100	1,200	5,710	0
E	10,770	4,270	420	6,550
F	10,770	4,270	6,970	0
G	13,170	4,470	4,380	0

Consequences

In all alternatives, only the area immediately adjacent to Trap Bay retains its Wilderness potential, and is recommended as Wilderness in Alternatives A and E. The remainder of the area south of Trap Bay is managed for development and does not retain its wilderness potential. Alternative C manages nearly the entire area for timber development and does not retain any potential for Wilderness.

(314) Point Craven

Gross acres: 11,847

National Forest acres: 11,837

Description

The Point Craven roadless area is located on Chichagof Island, north of Peril Strait, south of Sitkoh Creek and west of Sitkoh Bay. The community of Hoonah is about 49 miles to the north, and Sitka is about 32 miles to the south. The area is characterized by narrow river valleys, surrounded by steep mountains. Native peoples from the Sitka, Hoonah, and Angoon areas apparently used the area as there is evidence of sites and villages in and around the area. Early European entries were tied to hunting and exploration. Vegetation is typical southeast Alaska temperate rain forest. There are high populations of wildlife, including brown bear, deer, marten, mink, otter, bald eagles and a few resident bird species. Sport and subsistence deer hunting is very important in this area. Four types of salmon are valuable for commercial, subsistence and sport fishing in the area's waters. The steelhead run in Sitkoh Creek is one of the few major runs on islands in southeast Alaska and is heavily used. Although the wildlife and natural beauty are attractions, there is little to distinguish this roadless area from many other areas. There are no cabins or improved trails, although the popular Sitkoh Lake cabin is adjacent to the northwestern corner of this area.

Wilderness Potential

Other than the adjacent timber harvest areas, this area appears natural and unmodified. The opportunity for solitude is high once away from the coastal areas where there is heavy ferry, cruiseship, barge, and fishing boat traffic. There are high altitude overflights from commercial airliners and occasional small aircraft flights which may provide some distraction. The area provides primarily semi-primitive non-motorized recreation opportunities.

Resources

The area contains 4,095 acres of tentatively suitable forest land. The entire area is located within the Alaska Pulp Company long term timber sale contract area. The potential for managing timber in this roadless area is high due to large areas of operable timber and existing access roads. The potential exists to enhance primitive and/or semi-primitive recreation opportunities; however, the potential for anything other than a trail system is low. The area is commonly used by outfitter/ guides and potential is high for a significant increase in permits for them in the Sitkoh Creek area. The development potential for minerals is low or non-existent in the entire area. There are two unconveyed Native allotments on Sitkoh Bay. There has been strong concern expressed about the ability to maintain subsistence use in the Sitkoh Bay area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,240	8,780	1,820	0
B	4,520	5,500	1,820	0
C	11,240	340	260	0
D	10,020	280	1,540	0
E	2,570	340	260	0
F	11,240	340	260	0
G	11,240	340	260	0

Consequences

In all alternatives, the majority of this area is managed for timber development. In Alternatives A, B, and D, the area around Sitkoh Lake remains undeveloped but is too small to be eligible for consideration as Wilderness.

(317) Point Augusta

Gross acres: 19,479

National Forest acres: 19,479

Description

The Point Augusta roadless area, characterized by rounded mountains and long flowing streams, is located on the northeastern coast of Chichagof Island with Whitestone Harbor adjacent to its northwestern corner. Icy and Chatham Straits are to the north and the east respectively. False Bay and the Hoonah road system border to the south and west. There is evidence of prehistoric Native use in nearby areas indicating probable use here. At the time of Euroamerican contact, the Hoonah and Angoon Tlingit used this area of Chichagof Island. Hoonah is 10 miles to the north. Anchorages have been identified in Whitestone Harbor and False Bay. Permitted outfitters and guides use this area, and there is a special use permit for a lighthouse reserve in the area. Vegetation is typical southeast Alaska temperate rain forest. There is critical deer winter habitat in this area and bald eagles nest and root in trees along the shoreline and into the major drainages. Iyouktug Creek is an anadromous stream for pink and chum salmon. There are no recreation cabins and no unusual features in the area. Most of the use of the area is associated with the Hoonah residents, including boating, hunting and subsistence.

Wilderness Potential

This roadless area has had little human modification to the land base and is natural appearing. Because of its size, it offers an opportunity for solitude. The possibility of meeting other people is likely around the saltwater bays. The western and southern borders are modified by roading and harvesting which would be disruptive during timber operation. The area provides primarily an opportunity for semi-primitive non-motorized recreation.

Resources

The area contains 11,259 acres of tentatively suitable forest land. The potential for managing timber in the area is high because the whole area falls in the APC long term timber sale area. The existing nearby road system, log transfer facility, and the logging camp at Hoonah make the management of timber harvest economical. Harvest of 463 acres on the north side of Iyoktug Creek was approved in the 1986-90 operating period supplemental EIS for the APC long term sale. There is little recreation potential, although in 1979 there was a proposal to build an alpine trail system. A marine park is programmed for the Whitestone Harbor after harvesting has been completed and the log transfer facility closed. There is potential for a fish passage in the upper portions of Suntaheen Creek. There is no potential for mineral development. An increase in outfitter/guide use is probable. There is one Native land selection in this roadless area. Local issues concerning this area range from the economics of timber harvest to environmental issues.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	120	7,300	12,060	0
B	380	7,040	12,060	0
C	17,840	620	1,020	0
D	16,620	2,300	560	0
E	17,840	620	1,020	0
F	17,840	620	1,020	0
G	17,840	620	1,020	0

Consequences

Although the majority of the area in Alternatives A and B are managed for semi-primitive recreation, the core of the area is managed for development, greatly reducing its potential for Wilderness. In Alternatives C, D, E, F, and G, virtually the entire area is managed for intensive timber development and does not retain any potential for Wilderness.

(318) Whitestone

Gross acres: 6,140

National Forest acres: 6,100

Description

The Whitestone roadless area, a flat expanse of land about seven miles long and three miles wide, is located on the northeast side of Chichagof Island. Icy Strait borders the north, Whitestone Harbor the east, and the southern edge is bordered by harvested and roaded areas. Saltwater bays and estuaries are numerous and exhibit much variety. An anchorage is located in the northwest corner of Whitestone Harbor, a desirable harbor which receives heavy use from Hoonah boaters and transient mariners. The nearest community is Hoonah, 12 miles northwest, which provides most of the recreation, hunting and fishing activities in the area. Sites in nearby areas indicate prehistoric Native use of the area, and there are cultural resource evidence such as petroglyphs in the area. Vegetation is typical southeast Alaska temperate rain forest. The shoreline is considered critical deer habitat and the entire area is deer and brown bear habitat. Small mammals include marten and red squirrel. The Peale's peregrine falcon migrates through this area and is on the Federal Endangered and Threatened Species list. Except for permits for outfitter and guides, there are no other special use permits in the area. There are no recreation use cabins in the area.

Wilderness Potential

The area has been unmodified by human development so has good natural integrity. A high opportunity for solitude exists in this area along the northern shoreline and in the interior, but along the boundaries formed by roads and harvesting, opportunity for solitude diminishes. The area provides primarily semi-primitive non-motorized and semi-primitive motorized recreation opportunities.

Resources

The area contains 2,380 acres of tentatively suitable forest land. The potential for managing timber in this area is very high because it is entirely within the APC long term timber sale area. The existing nearby road systems make the management of this area for timber harvest economical. Because of the area's easy accessibility to Hoonah residents, there is increased recreational hunting and gathering potential. A marine park with outdoor recreation vehicle facilities has been proposed for Whitestone Harbor log transfer facility after logging is completed. In lower Suntaheen Creek, there are proposed log weirs for fish rearing and spawning habitat. There is no known mineral potential. Increased use by outfitter/guides is probable with an increased need. There are two Native withdrawals within this area. Local issues range from environmental issues to timber economics. Natives of Hoonah who use the area for subsistence gathering, feel that development and increased recreation are causing a scarcity of subsistence resources in their local area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	260	5,840	0
B	20	240	5,840	0
C	5,080	60	960	0
D	60	220	5,820	0
E	5,080	60	960	0
F	5,080	60	960	0
G	5,080	60	960	0

Consequences

Alternatives A, B, and D are managed for semi-primitive recreation and retain Wilderness potential. Alternatives C, E, F, and G are mainly managed for intensive timber development and do not retain their Wilderness potential.

(319) Pavlof-East Point

Gross acres: 10,900

National Forest acres: 10,900

Description

The Pavlof-East Point roadless area is located on the east side of Chichagof Island and is bounded by Chatham Strait, Tenakee Inlet and Freshwater Bay. Timber harvest units and roads form the inland boundary. The nearest communities are the Kennel Creek logging camp and Tenakee Springs. The large Pavlof drainage includes a river and lake which have significant salmon runs, waterfalls and a bay. Prehistoric information is limited, but it is very probable that this area was used by inhabitants of the region. At the time of Euroamerican contact, the Hoonah and Angoon Tlingit used this area of Chichagof Island. There are many historical Native, trading, and fishing sites. Vegetation is typical southeast Alaska temperate rain forest. The area contains much designated deer winter range; bald eagles roost and nest along the shoreline; Peale's peregrine falcon, which are on the Federal Endangered and Threatened Species List, migrate through the forest. The area has two recreation cabins, and several trails. Activities in the area include boating, fishing, kayaking, hiking, and hunting. Pavlof Harbor is a special feature because it offers protection from the weather on four sides, and therefore is used consistently by transit vessels. A State selection is located at Pavlof Lake and special use permits have been issued for cabins north of Pavlof Harbor and at Wachusett Cove.

Wilderness Potential

The natural integrity of the area has not been modified heavily by human activities. This area as a whole does not offer a high opportunity for solitude due to the Forest Service work center, road systems and logging camp, the population at Tenakee Springs, and the air and boat traffic. Only at the Pavlof Harbor and Lake would one experience a protected opportunity for solitude. The area does provide primarily semi-primitive non-motorized recreation opportunities.

Resources

The area contains 7,100 acres of tentatively suitable forest land. The potential for managing timber is high because the entire area is in the APC Long Term Timber Sale area. The existing nearby road systems and logging camp make the management for timber harvest economical. The Supplemental EIS for the 1986-90 operating period for the APC long term sale approved the harvest of 91 acres an extension of the East Point Road, which will have only minor influence on the integrity of the roadless area. Recreation potential includes additional cabin and trail construction, and possibly a campground on the lake. Pavlof Lake is also being considered for a fertilization program. Wildlife habitat improvement projects are possible. The potential for

increased outfitter and guide use is probable as need increases. The area was identified as having mineral development potential. Local issues range from timber economics to environmental issues.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	4,900	6,000	0
B	340	7,480	3,080	0
C	2,200	7,200	1,500	0
D	5,640	2,760	2,500	0
E	2,200	7,200	1,500	0
F	2,200	7,200	1,500	0
G	2,200	7,200	1,500	0

Consequences

In Alternative A, although 5,980 acres remain undeveloped, the area is fragmented by roads and loses potential for Wilderness. In all other alternatives, the majority of the area is managed for a mix of uses including timber harvest, losing its potential for Wilderness.

(321) Tenakee Ridge

Gross acres: 30,405

National Forest acres: 24,262

Description

Tenakee Ridge roadless area is a narrow rugged mountainous ridge on south-eastern Chichagof Island adjacent to the community of Tenakee Springs. The area is surrounded by timber harvest areas and roads on all sides. Principal features include the upper, unharvested, reaches of the Indian River, Pavlof River and Freshwater Creek drainages, which have high fishery and brown bear habitat values. The area has numerous cultural resource sites attributed to the Hoonah and Angoon Tlingit. Use of the area is primarily hunting, fishing and subsistence including wood gathering. There are no recreation facilities or constructed trails. The visual character of the area is common.

Wilderness Potential

The area is not modified by management activities, but due to adjacent harvest areas does not represent the full range of ecosystems typical of the maritime character of Chichagof Island. There is a high opportunity for solitude due in part to the lack of developed trails and features which concentrate use. Opportunity for primitive recreation is reduced by the proximity to roads and harvest areas on all sides. Although the road system offers a definable boundary, boundaries do not follow natural features.

Resources

The area contains 5,801 acres of tentatively suitable forest land. The entire area is within the long-term sale area of the Alaska Pulp Corporation. The existing logging road system adjacent to the area increases the economic potential of timber harvest in this area. The 1986-90 Supplemental EIS for the APC long term sale approved harvest of 189 acres in the Pavlov River drainage and extension of the existing road. The area has identified mineral potential. Potential for recreation development is limited to one identified potential trail connecting to Tenakee Springs. Use for subsistence activities and personal use wood gathering is likely to continue or increase.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	100	1,780	22,380	0
B	680	2,560	21,020	0
C	5,840	18,420	0	0
D	1,460	1,820	20,980	0
E	5,840	18,420	0	0
F	5,840	18,420	0	0
G	5,840	18,420	0	0

Consequences

In Alternatives A, B, and D, the majority of the area is managed for semi-primitive and primitive recreation, retaining its potential for Wilderness except for small areas of development around the area's perimeter. In all other alternatives, the area is managed mostly for roaded natural recreation with smaller areas of intensive development for timber harvest, and the area does not retain potential for future consideration as wilderness.

(323) Game Creek

Gross acres: 88,612
National Forest acres: 67,046

Description

The Game Creek roadless area, characterized by mountain ridges and drainages with wide open areas, is located in the middle of Chichagof Island. It is bounded by Huna Totem and Sealaska Corporation lands (which have been heavily roaded and harvested), the town of Hoonah, Tenakee Inlet, and Port Frederick. At the time of Euroamerican contact, the Hoonah and Angoon Tlingit used this area. There are many Native sites, including petroglyphs and a burial site. The area is typical southeast Alaska temperate rain forest. The Upper Game Creek area has important wildlife habitat and there are several areas of critical deer winter range in the area. Bald eagles roost and nest along the shore and Peale's peregrine falcon migrate through the forest. Game Creek is a major anadromous stream. Special features include some unusually large muskegs which provide openings for hunting and hiking, and the obviously glacially caused U-shaped valleys of Seagull Creek and Upper Game Creek. There are no recreation cabins or formal trails in the area, although recreation activities are numerous, including kayaking, dispersed camping, nature study, and saltwater boating and fishing. There is one Native selection in the area.

Wilderness Potential

The area has not been heavily modified and the natural integrity is maintained. There is high opportunity for solitude in the area between centers of human activity. Even though the area is surrounded by road systems, two are not easily accessible, and much of the recreation is dispersed. Possible future logging would definitely affect this area. Recreation opportunities are primarily semi-primitive non-motorized.

Resources

The area contains 21,835 acres of tentatively suitable forest land. Because the entire area falls into the APC Long Term Timber Sale area, the potential for managing timber is very high. The existing nearby road systems and logging camp make the management of this area for timber harvest economical. The 1986-90 Supplemental EIS for the APC long term sale approved harvest of 1,835 acres in upper Game Creek and Seagull Creek. Recreation potential includes increased hunting, fishing, dispersed camping, and possibly an alpine trail in VCU 204. Fish improvements are possible in Freshwater Creek drainage, Lake Creek, and Game Creek Drainage. An increase in outfitter/guide use of this area is predicted. There is mineral development potential in the area. One important issue to the people of the area is the maintenance of subsistence resources.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	960	2,520	63,570	0
B	2,600	2,860	61,590	0
C	48,630	17,090	1,320	0
D	7,320	2,280	57,450	0
E	48,630	17,090	1,320	0
F	48,630	17,090	1,320	0
G	48,630	17,090	1,320	0

Consequences

In Alternatives A, B and D the majority of the area is managed for primitive and semi-primitive recreation and retains its potential for consideration as wilderness. In Alternatives C, D, F and G the majority of the area is managed intensively for timber harvest and the potential for future consideration as Wilderness is foregone.

(324) Pleasant Island

Gross acres: 12,239
National Forest acres: 12,239

Description

The Pleasant Island roadless area consists of Pleasant Island and the Porpoise Islands, located north of Chichagof Island. The town of Gustavus and Glacier Bay National Monument lie to the north across Icy Passage. Unlike most islands in southeast Alaska, the terrain relief is not great and is characterized by flat stream-courses and rolling hills. There is no recorded pre-European use of the islands. Early Explorers used Pleasant Island heavily because of its easy access. Vegetation is typical southeast Alaska temperate rain forest. There are populations of deer, bear, bald eagles, Vancouver Canada geese, martin, otter, mink and a few resident sea birds. Sport and subsistence deer hunting are very important in this area. The major salmon species important for commercial, subsistence and sport fishing spawn and rear in the waters around this area. Most of the use of the area comes from Gustavus and Hoonah and includes such activities as kayaking, hiking, dispersed camping, and nature viewing. There are no recreation cabins on the islands. Research projects are being done on Pleasant Island by the Forest Service Research Lab and the National Park Service.

Wilderness Potential

Although the area has had long-time use by the residents of Gustavus, the area shows very little human influence. Air traffic, fishing fleets, and heavy use detract from the opportunity for solitude or primitive experiences in the area. The entire area provides for a semi-primitive, motorized recreation opportunity.

Resources

The area contains 3,020 acres of tentatively suitable forest land. The potential for managing timber in this area is estimated to be low because of the large areas of non-commercial timber or marginally operable timber and the lack of good log transfer facility locations. Also, this area is part of the Pleasant/Lemesurier Island area proposed as wilderness in pending Tongass legislation. Recreation emphasis is to promote no development but to emphasize scenic, wildlife and backcountry features. Potential is low for a significant increase in special use permits other than for incidental use. There is no mineral development potential. One potential Research Natural Area is located on Pleasant Island, encompassing the entire island. Local issues involve keeping Pleasant Island in a natural state for subsistence uses and for recreation.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	20	160	12,060
B	0	20	12,220	0
C	0	20	12,220	0
D	0	0	12,240	0
E	0	20	160	12,060
F	0	20	12,220	0
G	0	20	12,220	0

Consequences

In Alternatives A and E, almost the entire area is recommended as Wilderness. In all other alternatives, the area is managed for primitive or semi-primitive recreation, retaining its potential for Wilderness.

(325) Freshwater Bay

Gross acres: 72,029

National Forest acres: 63,206

Description

The Freshwater Bay roadless area is located on the northeast corner of Chichagof Island, including the northern shore of Freshwater Bay. The northern boundaries are Huna Totem and Sealaska Corporations lands which have been extensively roaded and logged; the southeast border is Chatham Strait. The area is quite mountainous with large deep stream drainages, but there are some flat areas at the head of Freshwater Bay. Nearby prehistoric sites indicate use in this area. At the time of Euroamerican contact, the Hoonah and Angoon Tlingit were using this area which existing sites can attest to. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, bear, Vancouver Canada geese, and bald eagle. The Peale's peregrine falcon migrate through and humpback whale inhabit nearby waters. Fishing, especially for salmon, in the abundant streams is a major source of subsistence for local residents. Sport and commercial fishing in area waters is common, too. There is an identified anchorage in False Bay, providing access to the area. There are also many identified recreation places for hiking, dispersed camping, kayaking, etc., although there are no recreation use cabins. A number of outfitter/guides use this area. The lyoukeen Peninsula, which is four miles long and 1/8 miles wide, is a special feature. There are two Native land selections and the patented Gypsum Mines private land in the area.

Wilderness Potential

Other than the gypsum mining operations area, the area has not been significantly modified and appears entirely natural. The opportunity for solitude is rated high because of the area's size, however there is the possibility of hearing logging operations and traffic from surrounding road systems. The area provides primarily primitive and semi-primitive non-motorized recreation opportunities.

Resources

The area contains 23,961 acres of tentatively suitable forest land. The potential for managing timber within the area is very high because the entire area falls into the APC Long Term Timber Sale area, and the existing road systems and communities make the management for timber harvest economical. The 1986-90 operating period Supplemental EIS approved the harvest of 3,157 acres in Seal Creek, Wukuklook Creek, Gypsum Creek and along the north side of Freshwater Bay, substantially affecting the area's wilderness potential. Recreation potential includes trail and shelter construction and increased outfitter/guide use. Various fish and wildlife projects have potential. The area was identified as having a moderate potential for mineral development. Local issues range from timber economics to environmental issues.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	2,200	48,900	12,100	0
B	27,580	23,520	12,100	0
C	46,810	14,560	1,840	0
D	50,920	3,900	8,380	0
E	46,810	14,560	1,840	0
F	46,810	14,560	1,840	0
G	46,810	14,560	1,840	0

Consequences

In Alternatives C, E, F, and G, the area is mainly managed for timber development, losing its potential as Wilderness. In all other alternatives, the area is managed for timber development, except for about 20% which is too fragmented to be considered as Wilderness.

(326) North Kruzof

Gross acres: 31,190
National Forest acres: 31,170

Description

The North Kruzof roadless area is located on the northern end of Kruzof Island and also includes Partofshikof Island to the east and a number of offshore islands and rocks. The area is bounded by Salisbury Sound, the Pacific Ocean, Neva Strait and Krestof Sound, and the southern boundary is a roaded and harvested area. The area is characterized by small irregular mountains, rocky islands, reefs and rock bluffs on the coast, and numerous bays and fiords that provide sheltered anchorage for boats. This large area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present use by a variety of Alaska residents and visitors. Use of the area has been primarily for hunting, fishing, boating, recreation, and temporary occupancy. There is one improved trail at Sealion Cove, but no recreation cabins. There are a number of authorized special uses existing in the area. The proximity of this area to the open North Pacific Ocean and the unimpeded movement of storms into the area from the southwest results in a high rainfall affecting the species somewhat, but it is primarily typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, bald eagle, and birds and waterfowl rearing and nesting areas are abundant. Special features include a beautiful mile-long white sand beach at Sealion Cove and the often dramatic high energy seas on the outer coast.

Wilderness Potential

The area is unmodified except for the evidence of current and historic use, mostly near the shoreline, which have a very low impact on the natural integrity. There is a moderate to high opportunity for solitude within the area and only an occasional airplane or boat would disturb anyone. The area provides a moderate to high opportunity for primitive recreation as a result of the area's size, landscape, many recreational opportunities, and physical challenges.

Resources

The area contains 8,452 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on the development of high market values and harvest methods without extensive roading. Potential for recreation is mainly for cabin construction. There are some opportunities for fish and wildlife improvement projects. There is a low potential for mineral development.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	80	3,240	26,250	0
B	80	3,280	26,210	0
C	4,770	20,980	3,820	0
D	26,990	460	2,120	0
E	4,770	20,980	3,820	0
F	4,770	20,980	3,820	0
G	4,770	20,980	3,820	0

Consequences

In Alternatives A and B, the area is managed for primitive and semi-primitive recreation, retaining its Wilderness potential, except for very small areas of moderate development. In Alternative C, E, F, and G the area is managed for roaded recreation, with 4,770 acres of intensive development in the center of the area, greatly reducing its potential for Wilderness. In Alternative, the area is intensively managed for timber, with no future potential as Wilderness.

(327) Middle Kruzof
Gross acres: 15,540
National Forest acres: 15,540

Description

The Middle Kruzof roadless area is a narrow L-shaped area in the middle of Kruzof Island which wraps around a large area of road systems and timber activity. It also includes the Nedezhda Island in Krestof Sound and a number of small offshore islands and rocks. The area is bordered on two sides by saltwater, including the Pacific Ocean and Krestof Sound. Access is good due to the bays that provide sheltered anchorage for boats, and the area's proximity to Sitka. This area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present use by a variety of Alaska residents and visitors. Use of the area has been primarily for hunting, fishing, recreation, and temporary occupancy. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer and brown bear, bald eagles, and bird and waterfowl rearing and nesting areas are abundant. There are no improved trails, recreation cabins, or attractions of special interest other than the natural features.

Wilderness Potential

The area is unmodified except for evidence of current and historic use of the area, which has had a very low affect on the natural integrity of the area. However, the narrow shape of the area makes it hard to ignore the adjacent timber harvests. There is a moderate opportunity for solitude within the area. Recreation use of the area is relatively limited and dispersed, so that encounters with others are unlikely. The sights and sounds of planes and boats can occasionally intrude on solitude, and road and off-road motorized recreation can be heard. The area provides only a moderate opportunity for primitive recreation as a result of its size, lack of screening, and physical challenges.

Resources

The area contains 5,827 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on the development of high market values and harvest methods which do not require extensive roading. Recreation potential includes building a cabin in Gilmer Bay. Its shape, size and lack of lakes or streams will restrict opportunities for managing this area for recreation in an unroaded condition. The area does not have a high mineral development potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	380	580	14,580	0
B	380	600	14,560	0
C	4,650	10,290	600	0
D	10,520	260	4,760	0
E	4,650	10,290	600	0
F	4,650	10,290	600	0
G	4,650	10,290	600	0

Consequences

In Alternatives A and B, the area is managed for semi-primitive recreation and retains its Wilderness potential. In Alternatives C, E, F, and G the area is managed for moderate and intensive development, losing its potential for Wilderness. In Alternative D, it is managed primarily for intensive development, with no potential for Wilderness.

(328) Hoonah Sound

Gross acres: 97,277
National Forest acres: 97,257

Description

The Hoonah Sound roadless area is located on Chichagof Island and is bounded by the West Chichagof-Yakobi Wilderness on the north and west, by Hoonah Sound to the east, and Peril Strait on the south. The large area displays a wide terrain variation, from flat river valleys to steep mountains. There is evidence of prehistoric and historic Native use; early European entries were for trade, hunting, and exploration. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include brown bear, deer, bald eagle, marten, otter, mink, beaver; there are few resident bird species. There are four salmon valuable for commercial, subsistence, and sport fishing that spawn and rear in these waters. There are no management activities beyond some fish habitat improvements. Although the wildlife and natural beauty of the area are attractions, there is little to distinguish this from other areas, although the known and suspected cultural resource sites are of interest.

Wilderness Potential

The area is unmodified except for minor activities, including trespass cabins and early sites, which do not detract from the natural integrity of the total area. The opportunity for solitude is very high. Terrain is such that all the ferry, cruiseship, fishing, and barge traffic have little influence away from the coastline. The area provides primarily primitive recreation opportunities.

Resources

The area contains 24,406 acres of tentatively suitable forest land. The entire area is within the APC Long Term Timber Sale area. There are some areas with operable and accessible timber which would make timber management potential high, however this area is a part of the Chichagof area proposed as wilderness in pending Tongass legislation. There is potential to build trails and cabins, especially along the coast. There is fish habitat improvement potential, but no wildlife improvements are planned. No current special use permits exist, but possible future permits would be for subsistence or recreational facilities or for outfitter/guide services. Special use permits are anticipated to rise in conjunction with the new herring pond fishery to be permitted by the State. The development potential for minerals is moderate in VCU 281, but low or non-existent in the rest of the area. There are four unconveyed Native allotments within the area. Local concerns are primarily related to subsistence uses and commercial fishing as affected by timber harvest, or the elimination of jobs due to creation of wilderness.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	1,220	100	95,920
B	27,420	15,110	54,700	0
C	75,010	17,700	4,530	0
D	88,510	4,690	4,030	0
E	1,220	80	20	95,920
F	48,030	9,030	40,170	0
G	56,690	11,870	28,680	0

Consequences

In Alternatives A and E, the majority of the area is managed as Wilderness. In Alternative B, the area around Patterson Bay retains its potential for Wilderness, while the rest is managed for timber. In Alternative C, almost all of the area is managed for intensive timber production.

(329) South Kruzof

Gross acres: 56,701
National Forest acres: 56,701

Description

The South Kruzof roadless area is generally characterized by a large gently sloping shield volcano dominated by the volcanic cone named Mount Edgecumbe located on the southern half of Kruzof Island. It is bounded on the west by the Pacific Ocean, on the south and east by Sitka Sound, and on the north by the road system and timber activity in the area between Shelikof Bay and Mud Bay. The area also includes a number of small offshore islands and rocks. The western and southern shores have poor boat anchorages and frequent rough water. This large area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present use by a variety of Alaska residents and visitors. Primary use of the area has been for hunting, fishing, recreation, and temporary occupancy. Vegetation is typical southeast Alaska temperate rain forest, although several plant species have been identified that are uncommon or at edge of their range. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl rearing and nesting areas are abundant in this area. The major special features are the volcanic landforms over the area; high quality fishing opportunities in the streams and lakes is also an attraction. One improved trail, the Mt. Edgecumbe Trail, and two recreation cabins are in the area.

Wilderness Potential

The area is unmodified except for the evidence of current and historic use of the area, which have had a very low overall effect on its natural integrity. There is a moderate opportunity for solitude within the area, but encounters with others are unlikely. The area provides a moderate opportunity for primitive recreation as a result of its size, vegetative screening, and physical challenges. The unique landforms, diverse vegetation, streams, bays and varied coastline contribute to these opportunities.

Resources

The area contains 7,468 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on the development of high market values and harvest methods which do not require extensive roading. Although additional trails and cabins are possible, none are planned at present. The unique volcanic features and scenery in the area provide opportunities for increasing dispersed recreation. A portion of the area has been identified as having Research Natural Area potential in order to include examples of several major volcanic landforms and a small watershed under the unique hydrological influence of volcanic ash soils. The area does not have a high mineral development potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	2,800	38,620	15,280	0
B	2,800	40,160	13,740	0
C	20	53,860	2820	0
D	20	50,810	5,870	0
E	20	53,860	2,820	0
F	20	53,860	2,820	0
G	20	53,860	2,820	0

Consequences

In Alternatives A and B, the potential Research Natural Area would retain its Wilderness potential, with the rest being managed for moderate or intensive timber development. In all other alternatives, the entire area is managed for moderate timber development, losing its potential for Wilderness.

(330) North Baranof

Gross acres: 343,617
National Forest acres: 341,417

Description

The North Baranof roadless area is located on the northern end and northeastern side of Baranof Island and also includes Catherine Island and a number of offshore islands and rocks. It is bordered on three sides by saltwater, providing a long coastline, deeply and repeatedly scalloped by fiords and bays which provide sheltered anchorage for boats and good access. The western boundary adjoins the Sitka Urban Roadless area and part of the southern boundary adjoins the South Baranof Wilderness. In eighteen locations along its boundary, timber activities and roads have taken place substantially influencing the area. The area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present use by a variety of residents and visitors. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl rearing and nesting areas are abundant. There are a number of authorized special uses in the area, three improved trails, two cabins, and four parcels of land within or adjacent to the area under other ownership. Three features of special interest are Kelp Bay, Baranof Warm Springs, and the Baranof Island glaciers. Most of the use of the area is for boating, hunting, fishing and nature viewing.

Wilderness Potential

The area is unmodified except for evidence of current and historic use which has had a very low overall effect on its natural integrity. There is a very high opportunity for solitude within the area increased by its size, the topographic screening, and the limited dispersed recreation use. The sights and sounds of occasional airplanes, boats and ferries may intrude on a visitor's solitude. The area provides a very high opportunity for primitive recreation provided by the highly irregular topography, diverse vegetation, and the many lakes, streams, bays and rugged mountains.

Resources

The area contains 63,396 acres of tentatively suitable forest land. The potential for managing timber is dependent on the development of high market values and harvest methods which do not require extensive roading. There are many opportunities for developed recreation such as cabins and trails and the area itself offers unlimited dispersed recreation potential. Existing special use permits would likely continue. The area does not have a high mineral development potential. The area around Lake Eva has been identified as having potential for Research Natural Area status because it represents a highly productive sockeye fishery with an active history of research.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	15,290	159,650	165,840	0
B	99,950	78,770	162,060	0
C	125,490	98,390	116,890	0
D	210,210	9,630	120,940	0
E	125,490	98,390	116,890	0
F	125,490	98,390	116,890	0
G	125,490	98,390	116,890	0

Consequences

In all alternatives, the areas that remain completely undeveloped and retain their Wilderness potential are the drainage containing Lake Eva, and the east side of Baranof Island from Kelp Bay south to the Wilderness boundary. In Alternative A, the remaining area is managed for a mix of uses including timber harvest. In Alternative D, the remaining area is managed intensively for timber harvest development, losing its Wilderness potential. In the other alternatives, the remaining areas are managed for a mix of uses, including timber harvest development, losing their Wilderness potential.

(331) Sitka Urban

Gross acres: 138,146
National Forest acres: 120,536

Description

The Sitka Urban roadless area is located on the western side of Baranof Island just north of the center of the island. It is bounded on the west by Nakwasina Sound and Sitka Sound which are influenced by the development related to the community of Sitka. The southern boundary adjoins a roadless area and the South Baranof Wilderness; the north and eastern boundaries are also formed by a roadless area. An irregular, rugged mountain chain forms a scenic backdrop to the city of Sitka, while the west coast is characterized by rugged headwalls, cliffs and escarpments resulting from exposure to the sea wind and waves. This large area has a long and varied history of use dating from prehistoric and historic Tlingit use to present use by a variety of residents and visitors. The Russians settled in Sitka in 1799 and it has had constant use since. Although Sitka is outside this area, its residents use it intensively. Use of the area has been primarily for hunting, fishing, boating, woodcutting, recreation, and occasional temporary occupancies. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl rearing and nesting areas are abundant. The mountains east of Sitka enhance the beauty of the area and provide a watershed for the community. There are four improved trails, but no recreation cabins in the area.

Wilderness Potential

The area is unmodified except for the evidence of current and historic use which has had little effect on its overall natural integrity. There are many opportunities for solitude within the area due to size, screening, and overall limited dispersed recreation use; however, a visitor may have to work harder to find them. The sight or sound of airplanes, boats, motor vehicles, and the community of Sitka can occasionally intrude on a visitor's solitude. The area provides primarily a semi-primitive non-motorized recreation opportunity.

Resources

The area contains 8,452 acres of tentatively suitable forest land. The potential for managing timber is dependent on the development of high market values and harvest methods which do not require extensive roading. The area provides an unlimited recreation potential for dispersed recreation. Additional trails and cabins or shelters are possible. With the large numbers of visitors to Sitka, use of trails within walking distance of town or the campgrounds would be substantial. There is potential for both fish and wildlife improvement projects. The southwestern and central portions of the area both contain mineral development potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	160	74,820	44,960	0
B	16,360	58,620	44,960	0
C	28,730	73,600	17,600	0
D	19,840	56,750	43,340	0
E	28,730	73,600	17,600	0
F	28,730	73,600	17,600	0
G	28,730	73,600	17,600	0

Consequences

In Alternative A, about two thirds of the area is managed for a mix of uses with moderate development. Two areas, the Indian River drainage and the area between Katlian Bay and Nakwasina Sound, are managed for semi-primitive recreation and retain limited Wilderness potential. The effect of Alternatives B and D are similar to Alternative A, except that more acres are managed intensively for timber harvest. In Alternatives C, E, F and G more of the area is managed intensively for timber harvest than the others, including much of the area near Nakwasina Sound. Only the area in the Indian River drainage retains any potential for Wilderness.

(332) Sitka Sound

Gross acres: 20,934
National Forest acres: 19,475

Description

The Sitka Sound roadless area is composed of Krestof Island, Halleck Island, the Siginaka Islands, the Magoun Islands, a number of small offshore islands and rocks, and a peninsula of Baranof Island separated from the rest of Baranof Island by a road system and timber activity. The area is generally located between Sitka Sound and Salisbury Sound, and between Kruzof Island and Baranof Island. This area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present day. The major attraction of the area is the beauty of the islands themselves, seen by many visitors to Alaska while riding the ferries through them. There is one improved trail in the area, but no recreation cabins. Most use of the area is associated with recreational boating, hunting and fishing, and viewing the wildlife and scenery. The area is typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl rearing and nesting habitat are abundant. Peale's peregrine falcon migrate through the forest and the humpback whale inhabits nearby waters.

Wilderness Potential

The area is unmodified except for the evidence of current and historic use of the area, which has a very low overall effect on its natural integrity. There is a moderate opportunity for solitude within the area. Only the occasional sights and sounds of airplanes and boats along the coastline can intrude on a visitor's solitude. The area provides a moderate opportunity for primitive recreation as a result of its dense vegetative screening, physical challenges, streams, bays and varied coastline.

Resources

The area contains 7,298 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on the development of high market values and harvest methods which do not require extensive roading. The varied terrain, diverse vegetation, and attractive scenery of this area provide unlimited recreation potentials for dispersed recreation. Additional trails and cabins or shelters are possible. The area does not have a high mineral development potential and there are no known claims.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	1,360	18,120	0
B	0	2,060	17,420	0
C	0	15,100	4,380	0
D	6,560	2,600	10,320	0
E	0	15,100	4,380	0
F	0	15,100	4,380	0
G	0	15,100	4,380	0

Consequences

In all alternatives, except Alternative D, the majority of the area is managed for semi-primitive recreation, retaining its potential for Wilderness. In Alternative D, one third of the land is managed for intensive or moderate development, losing its potential as Wilderness.

(333) Redoubt

Gross acres: 79,471
National Forest acres: 75,732

Description

The Redoubt roadless area includes a main section on western Baranof Island and a secondary section composed of numerous offshore islands. It is bounded by the Pacific Ocean and Sitka Sound on the west and northwest, by Silver Bay and the Vodopad River watershed on the northeast, and it adjoins the South Baranof Wilderness on the southeast. In addition to evidence of use by the Russian settlers, fisheries activities and other occupancies have occurred throughout the area. The area is characterized by a coastline deeply indented by fiords and bays offering safe anchorages, and also by Redoubt Lake and Deep Inlet; it is further characterized by the hundreds of extremely irregular and exposed islands and rocks off the western coast which provide an opportunity for very dynamic surf waterforms. Vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl nesting and rearing habitat are abundant. There is only one Forest trail and one recreation cabin within the area, but there are also a few non-system trails. Most of the use of the area is associated with recreational boating, hunting and fishing, and viewing wildlife and the scenery. There are a number of authorized special uses existing within the area, including an interagency agreement with ADF&G for fisheries management facilities at Salmon Lake and at Redoubt Lake.

Wilderness Potential

The area is unmodified except for the evidence of current and historic uses which have a very low overall effect on the natural integrity. There is a moderate opportunity for solitude within the area provided by the area's size and its topographic and vegetative screening. Encounters with others are only likely around Redoubt Lake and its cabin. Airplanes, boats, the nearness of Sitka, and air pollution from the pulp mill could all intrude on one's solitude. The area provides a moderate opportunity for primitive recreation.

Resources

The area contains 22,694 acres of tentatively suitable forest land. The potential for managing timber in this roadless area is dependent on the development of high market values and harvest methods which do not require extensive roading. The area provides unlimited dispersed recreation potential. Additional trails and cabins or shelters are possible. There is opportunity for fertilization of Redoubt Lake to enhance fish production. Redoubt Lake offers opportunities to study unique ecological and physical phenomena related to its meromictic characteristics.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,880	17,910	55,890	0
B	3,430	16,360	55,890	0
C	7,110	23,890	44,680	0
D	37,380	14,400	23,900	0
E	7,110	23,890	44,680	0
F	7,110	23,890	44,680	0
G	7,110	23,890	44,680	0

Consequences

In all alternatives, except Alternative D, the area around Redoubt Lake retains its Wilderness potential. In Alternatives A and B, about 75% of the area is managed for semi-primitive recreation, retaining its potential for Wilderness. The remaining is managed for moderate to intensive timber development, losing its Wilderness potential. In Alternatives C, E, F, and G slightly less area is managed for semi-primitive recreation, with slightly more subject to development. In Alternative D, fragmented areas amounting to about 36% of the area is managed for semi-primitive recreation, but does not retain its Wilderness potential, while the majority of the rest of the area is managed for intensive timber development, also losing its potential as Wilderness.

(334) Port Alexander

Gross acres: 126,636

National Forest acres: 126,120

Description

The Port Alexander roadless area is located on the southern tip of Baranof Island. It is bounded on the west by the Pacific Ocean, on the east by Chatham Strait, and on the north by the South Baranof Wilderness. The area displays a coastline deeply and repeatedly scalloped by fiords and bays, the result of the Baranof landmass dipping down beneath the ocean surface. The area has possibly the highest rainfall zone in North American with a long-term average annual precipitation of 224 inches. This large area has a long and varied history of use dating from Tlingit use in prehistoric and historic times to the present use by a variety of Alaska residents and visitors. The vegetation is typical southeast Alaska temperate rain forest. Wildlife include deer, brown bear, and bald eagle; birds and waterfowl rearing and nesting habitat are abundant. There is one improved trail and one non-system trail in the area, but no recreation cabins. Most use of the area is associated with recreation boating, hunting and fishing, and viewing wildlife and the scenery of the area. Special features are related to water: the high precipitation and its ecological effects; the large number of lakes; and the extremely carved coastline. There are a number of authorized special uses in the area and two parcels of private land at Port Alexander and Port Armstrong.

Wilderness Potential

The area is unmodified except for the evidence of current and historic use of the area, such as old canneries, pipelines, prospecting and the community of Port Alexander; however, they have a very low overall effect on the natural integrity of the area. There is a very high opportunity for solitude within the area, with only the sight or sound of airplanes or boats to occasionally intrude on a visitor's solitude. The area provides a high opportunity for primitive recreation as a result of its size, topographic screening, and physical challenges.

Resources

The area contains 12,660 acres of tentatively suitable forest land. The potential for managing timber in this area is dependent on the development of high market values and harvest methods which do not require extensive roading. There is unlimited potential for dispersed recreation, and additional trails and cabins or shelters are possible. There are opportunities for fish stocking throughout the area, and for constructing a fish passage in Big Branch Bay. The area generally has no known minerals development potential, except for a historic claim on a Nickel-Copper deposit on the north side of Snipe Bay. The Lover's Creek area has been inventoried as a potential Research Natural Area in order to study the phenomena associated with its high precipitation.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	126,000	0
B	0	0	126,000	0
C	0	0	126,000	0
D	97,350	1,120	27,530	0
E	0	0	126,000	0
F	0	0	126,000	0
G	0	0	126,000	0

Consequences

In all alternatives, except Alternative D, the entire area is managed for semi-primitive and primitive recreation, retaining its potential for Wilderness. In Alternative D, the majority of the area is managed for intensive timber development, losing its potential for Wilderness. An area of about 27,000 acres on the south end of Baranof Island retains its Wilderness potential.

(338) Brabazon Addition

Gross acres: 500,374
National Forest acres: 500,374

Description

The Brabazon Addition roadless area is located on the mainland, northeast of Yakutat. The area adjoins the Russell Fiord Wilderness to the west, the Canadian border to the east, the Glacier Bay National Park to the southeast, and the Yakutat Foreland roadless area to the south. Access is by foot or by ski-equipped small plane. The area is characterized by steep, rugged mountains, interspersed with or surrounded by glaciers which moderate the terrain by providing large, relatively flat areas. The glaciated state of the entire area indicates there is no human history, other than occasional use. Vegetation is sparse and consists of lichens, mosses and grasses. Tree or brush species are unusual and infrequent. There is some fishing activity in the two lakes adjacent to the southeastern boundary. The only known use by wildlife is by mountain goats, with some possible use by bears. No Forest Service management activities have occurred or are planned. There is no known subsistence use. Attractions of the area include sightseeing (primarily from aircraft), ice climbing and possibly rock climbing. The rugged mountains, springing from massive ice fields, provide a spectacular view.

Wilderness Potential

The Brabazon Addition is unmodified; the appearance is entirely wild and natural. The surrounding areas are also all roadless and unmodified and their terrain is such that development of any kind is unlikely to occur. The opportunity for solitude is very high over the whole area due to its huge size and high degree of difficulty of access, and very low visitor numbers. The area provides primarily primitive recreational opportunity.

Resources

The area contains no timber resources and no potential for development of such. Remoteness and rugged terrain limit recreational opportunities to the primitive. Although they would receive very little use, potential exists for trails and cabins. The opportunity for mineral development appears low. The nearest community is Yakutat, located 38 miles to the southwest; however, there is little use by local residents.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	500,350	0
B	0	0	500,370	0
C	0	0	500,190	0
D	0	0	495,360	0
E	0	0	500,170	0
F	0	0	500,190	0
G	0	0	500,190	0

Consequences

In all alternatives, the area is managed for primitive recreation, retaining its potential for Wilderness.

(339) Yakutat Forelands

Gross acres: 336,012
National Forest acres: 305,871

Description

The Yakutat Forelands roadless area is located on the mainland, east and southeast of Yakutat. The area adjoins National Forest System, State and private lands to the west, Glacier Bay National Park to the east and the Gulf of Alaska to the south. Forest Highway 10, the Russell Fiord Wilderness and the Brabazon Range bound the area on the north. The area has very diverse geography and topography: about 80 percent is relatively flat; the northeast contains steep and highly dissected mountains with numerous streamcourses and several glaciers; the Gulf beach area is subject to drastic change due to open-water wave activity and ocean storms, and contains an extended stretch of sand dunes, one of only two in Alaska. Much of the vegetation in the lowlands is marsh and muskeg species or willows, cottonwoods and alders on the drier sites. Timbered areas are typical southeast Alaska temperate rain forest species. The area has a long history of use, including prehistoric and historic Tlingit occupation, and European and Russian exploration. Annual salmon production for the area is estimated at more than 250,000. There is considerable commercial, sport and subsistence use of fish resources in the area. Wildlife include brown and black bears (including the glacier bear, a blueish color phase of the black bear), moose, wolverine, deer, and furbearers. Humpback and gray whales, seals, sealions, orcas, dolphins and porpoises can be viewed from the beach area. There are 10 recreation cabins, with airstrips associated with six locations, and 4 trails in the area. Outfitter/guide use is heavy. There is one private parcel in the area, and a strip along the Situk River has tentatively been selected by Sealaska.

Wilderness Potential

The area generally appears unmodified, although there have been modifications in the form of cabins and camps which are mainly scattered and unobtrusive. The opportunity for solitude is high over most of the large area which has a high degree of difficulty of access and low visitor numbers. Exceptions are locations along the western edge and along Forest Highway 10 where people tend to concentrate. The area provides for the full spectrum of recreation opportunities, including primitive opportunities.

Resources

The area contains 59,716 acres of tentatively suitable forest land, although there is little timber over 50 percent or more of the area. The potential for timber management is low, even with high quality, very high volume stand. About two thirds of the area is proposed for wilderness by pending Tongass legislation. Recreation potential includes trail and shelter construction. Sport fishing and hunting are major activities in the area. There is potential for both fish and wildlife resource improvements. There are approximately 130 special use permits for uses such as fish camps, outfitter/guides, subsistence and trapping camps, and recreation cabins. The potential for increase of number of permits is high. The opportunity for mineral development appears low. There are five inventoried potential Research Natural Areas. The general feeling of the local residents seems to favor a primitive/semi-primitive designation without the area becoming a Wilderness Management Area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	2,860	104,260	214,750
B	0	11,060	310,800	0
C	10,100	132,660	179,100	0
D	67,900	5,660	248,310	0
E	10,100	8,550	88,460	214,750
F	10,100	8,550	303,220	0
G	10,100	9,750	302,020	0

Consequences

In Alternatives A and E, two thirds of the area is recommended as Wilderness located east of Dangerous River and south of the Brabazon Addition boundary. In Alternatives B, F, and G the majority of the area is managed for a mix of old-growth habitat and primitive recreation, retaining its Wilderness potential. In Alternative C, the area south of the Brabazo range is managed for a mix of moderate development prescriptions including timber harvest, while the area north of the range is managed for primitive recreation and retains its Wilderness potential. In Alternative D, all of the tentatively suitable land is managed for timber harvest, located in three large blocks between the Dangerous River and Dry Bay. Wilderness potential is around the Akwe Lakes and north of the Brabazon Range and the Alsek River.

(341) Upper Situk

Gross acres: 62,140

National Forest acres: 61,722

Description

The Upper Situk roadless area is located on the mainland, east of Yakutat. The area adjoins National Forest System, State and private lands to the southwest, Forest Highway 10 and National Forest lands to the south, Russell Fiord Wilderness Area to the north, and Yakutat Bay to the west. Almost all of the area is relatively flat. The far western portion contains many lakes, varying in size to over 950 acres (Lake Redfield). The Yakutat Bay beach area is subject to change due to open-water wave activity and ocean storms. The area has a long history of use, from early Tlingit occupation to present day use by a variety of Alaskans and visitors. Vegetation is typical southeast Alaska temperate rain forest. Fish resources include five species of Pacific salmon, valuable for commercial, subsistence and sport use; a unique species, the northern pike, is located in Pike Lakes. Wildlife include both brown and black bear, moose, wolverines and wolves, deer, and some furbearers. There are few resident bird species; however, the area is heavily used by migratory species, including the trumpeter swan and peregrine falcon. There is one maintained trail. Additional uses include sport fishing and hunting, subsistence fishing, hunting and trapping, and commercial fishing. There are several cabins and camps under special use permit.

Wilderness Potential

This area, which is a very narrow strip, is basically unmodified. However, all-terrain vehicle use is highly evident along the beaches, river bottoms, muskegs and upland trails, and the entire southern boundary has been highly modified by logging and roading. The opportunity for solitude is high over much of the area, because of the proximity of the Russell Fiord Wilderness, but some areas receive concentrated use. The area provides primarily semi-primitive motorized and semi-primitive non-motorized recreation opportunities.

Resources

The area contains 30,203 acres of tentatively suitable forest land. The potential for timber management is high in those areas containing operable timber stands, but the present market situations make the timber inoperable. Recreation potential includes trail corridors and increased sport fishing and hunting. There are opportunities for both fish and wildlife resource improvement projects. The potential for increased outfitter/guide permits is moderate. Mineral development potential appears low, although oil and gas development potential appears high. The general feelings of the local residents seem to favor a primitive- semi-primitive designation for the area, without it becoming a Wilderness Management Area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	2,660	32,860	0
B	100	16,130	19,290	0
C	20,780	2,940	11,800	0
D	20,870	2,120	12,530	0
E	20,780	2,940	11,800	0
F	20,780	2,940	11,800	0
G	20,780	2,940	11,800	0

Consequences

In Alternative A, the majority of the area is managed for old-growth habitat and retains its Wilderness potential. In Alternative B, the area west of Situk Lake retains limited Wilderness potential, with the remaining being managed for a moderate development prescription. In all the other alternatives, all of the tentatively suitable land is managed for intensive timber development and loses its potential for Wilderness.

(501) Dall

Gross acres: 137,329 acres
National Forest acres: 108,260

Description

Dall Island roadless area is on the west side of Dall Island which is the largest island off the west coast of Prince of Wales Island. The northern tip of the island is about 20 miles southwest of Craig. The area is well defined by saltwater and the visual condition has remained unaltered, except for adjacent Native owned lands on the East coast which have begun to be intensively logged and roaded. Principal features include spectacular cliffs with sea caves along the high energy coastline facing the Pacific Ocean, many bays and inlets, and numerous short drainages. Upland areas are typical of southeast Alaska temperate rainforest. There are large populations of Sitka black-tailed deer and black bear, otter and beavers. The area has a significant history in the Native culture, resulting in large blocks being selected by the Native Corporations. There is one recreation-use cabin on the southern part of the island, but no established trails.

Wilderness Potential

There has been little active management of the upland area.
There is excellent opportunity for solitude, except in areas adjacent to Native lands. Primitive recreation opportunity is excellent due to the lack of trails and roads and the difficulty of access from saltwater.

Resources

The area contains 51,578 acres of tentatively suitable forest land. Because almost all land surrounding good anchorages are Native owned, and the high energy west coast is not suitable for boat or float plane access, potential access for timber cutting, recreation facility construction, and other management activity are complicated. However, the area has high sport fish value, excellent potential for cross-island trails, and many sites for recreation-use cabins on the bays. There is some potential for mineral activity and there is one special use permit for a short power line on the northeast corner. Local subsistence use and hiking is likely to continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	22,330	27,760	58,170	0
B	45,560	4,520	58,170	0
C	91,960	6,440	9,860	0
D	87,620	3,540	17,100	0
E	91,960	6,440	9,860	0
F	91,960	6,440	9,860	0
G	91,960	6,440	9,860	0

Consequences

In alternatives A and B, over 50 percent of the the area generally retains its undeveloped character. However, the remaining roadless areas are fragmented by areas of moderate and intensive development along the narrow, indented west coast and the steep lands along the island's central ridge. Only the southern tip of Dall Island retains any significant potential for future consideration as Wilderness in all of the alternatives.

(502) Suemez

Gross acres: 37,164
National Forest acres: 36,327

Description

Suemez Island roadless area, located off the west coast of Prince of Wales Island and about 15 miles southwest of Craig, is characterized by ruggged mountains on the coast and moderate to flat topography in its center. Three sides are bounded by the Pacific Ocean or large saltwater channels, while the eastern boundary is an irregularly shaped roaded and logged area. Existing timber harvest extends into the center of the island. Outstanding scenic features located primarily on the southern coast from Arena Cove to Cape Felix include a variety of beach types, volcanic rock forms, spectacular cliffs with sea caves, and unique intertidal rock forms. The island's history evolves around use by Native cultures, early 1900s commercial fisheries, and most recently, timber harvest. The State has selected one parcel of land in the Port Dolores area where a small community or recreation site may be developed. The area is used for deer and bear hunting, some subsistence use, and some offshore fishing and crabbing. There are no developed recreation facilities; however, Waterfall Resort is located across Ulloa Channel east of Port Refugio.

Wilderness Potential

The timber harvest in the Port Refugio area reduces the natural appearance of a small part of the island which is typical coastal Southeast Alaska temperate rain forest. When no logging occurs, the opportunity for solitude is very good. Almost all hunting occurs in the logged area. Due to coastal recreation attractions and the Island's remote outer coast, there are outstanding opportunities for primitive recreation. The recreation, scenic, and geologic values of Arena Cove-Cape Felix are recognized and protected by the Suemez Island Management Plan.

Resources

The area contains 20,663 acres of tentatively suitable forest land. The east-central part of the island has been harvested, and two independent timber sales are being prepared. Mineral development potential is very low. Excellent potential exists for trail development, and recreation cabin or shelter sites have been identified in the Arena Cove area. There is very good deer and bear habitat. Local subsistence and recreation use would likely continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	9,450	18,070	8,800	0
B	24,750	2,770	8,800	0
C	32,170	3,960	200	0
D	27,760	2,920	5,640	0
E	32,170	3,960	200	0
F	32,170	3,960	200	0
G	32,170	3,960	200	0

Consequences

In alternative A, B, and D and area of 5,640 to 8,800 acres is managed to retain its undeveloped character and potential as Wilderness around the Arena Cove-Cape Felix area; harvest of suitable timber is emphasized in most of the remaining area. In alternatives C, E, F, and G all of Sumez Island is managed intensively for timber harvest and no Wilderness potential is retained. Alternatives A, B and D all retain the potential for recreation development and use in the Arena Cove-Cape Felix area.

(503) Outer Islands

Gross Acres: 103,121

National Forest acreas: 102,881

Description

The Outer Islands roadless area consists of six major islands: Lulu, Noyes, Baker, San Fernando, St. Ignace, San Juan Batista, and numerous smaller islands off the west coast of Prince of Wales Island and 5-10 miles west of Craig. The islands are located next to the major commercial salmon fishing grounds and serve as shelters and anchorages for the fleet. Terrain varies from rugged mountains to flat land. Principal features include the saltwater bays and inlets, spectacular cliffs and sea caves on the outer coast, beaches, and an historic Native townsite on Baker Island being considered for an interpretive site. All the islands have deer, bear, otter, beaver, and puffins frequent the west coast of Noyes Island. These islands have a significant place in the history of Alaskan Native culture and the Natives have selected traditional-use sites on Noyes and San Juan Bautista Islands. The commercial fishing fleet is the largest user of the area, but residents and tourists use it for fishing, hunting, and subsistence.

Wilderness Potential

This island group, which is typical Southeast Alaska coastal temperate rain forest, possesses outstanding natural integrity, and is not seriously affected by the logged small Native block on Noyes Island. Therefore, there is excellent opportunity for solitude and primitive recreation experiences, especially on Noyes and Baker Islands.

Resources

The area contains 46,488 acres of tentatively suitable forest land. There is considerable public concern over future management of the Outer Islands. It has been suggested that logging be excluded and that the area be designated a National Recreation Area. Preplanning has occurred on Noyes Island, but has never been executed. The inside waters are excellent for sport salmon and halibut fishing. There are excellent recreation opportunities to develop canoe/kayak routes, cabin sites, and hiking trails. All islands are accessible by boat from Craig, providing opportunity to develop recreation in a unique offshore marine environment. Mineral potential is low. Local subsistence and dispersed recreation activities would likely continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	4,820	800	97,260
B	16,720	5,010	81,160	0
C	98,250	4,430	200	0
D	81,430	3,650	17,800	0
E	5,580	0	40	97,260
F	26,960	380	75,540	0
G	26,960	380	75,540	0

Consequences

In Alternatives A and E all of the area is recommended for designation as Wilderness, precluding mineral entry. In Alternatives B, F, and G all of the islands except San Juan Bautista are managed for primitive recreation without timber harvest and Wilderness potential is retained on most of the area; San Juan Bautista is intensively developed for timber harvest. In Alternative C all of the islands are managed intensively for timber harvest and no Wilderness potential is retained. In Alternative D a portion of Baker Island is managed for primitive recreation and retains minimal potential as Wilderness, while the remainder of the area, including San Juan Bautista are managed intensively for timber harvest and retain no potential for future consideration as Wilderness.

(504) Sukkwan

Gross Acres: 53,256

National Forest Acres: 46,145

Description

The Sukkwan roadless area, located about 30 miles south of Craig and east of Dall Island, consists of Sukkwan and Goat Islands, two small areas on Prince of Wales Island, plus a series of small islands. There is a very irregular coastline and many of the islands have low elevations with flat to rolling topography. All of this area is within the principal traditional-use area of the Haida Natives who have made extensive land selections which are being logged. Boundaries consist primarily of survey lines for the private land, or large expanses of saltwater. The notable features are the diverse clusters of islands and coves (especially in the Dunbar Inlet area), saltwater bays and inlets, and high populations of Sitka black-tailed deer, black bear, otter, marten, mink, loon, and common waterfowl. Areas are typical of southeast Alaska temperate rain forests. There is occasional recreation use and some subsistence activities. Mineral development potential is very low. There are no recreation facilities or trails. The visual character of the area is common.

Wilderness Potential

The area has received very little resource management attention due its lack of good access and rather low potential for resource management. The opportunity for solitude is excellent and it has good opportunity for primitive recreation, particularly on the outside shores of Sukkwan Island in the Dunbar Inlet area. Native and State land selections have influenced the boundary of this area.

Resources

The area contains 13,943 acres of tentatively suitable forest land. Both the Haida Natives and the Haida Native Corporation have a strong interest in the future of this area because of its historic occupancy and because of adjacent corporation land selections. Mineral development potential is very low. This general area is identified as the southern end of a potential kayak route along the west coast of Prince of Wales Island. Public use is minor with little potential for development, except for a few primitive campsites or shelters. The area has a few good anchorages for large boats.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	21,230	3,340	21,570	0
B	28,250	2,780	15,120	0
C	44,410	1,400	340	0
D	34,560	1,040	10,550	0
E	44,410	1,400	340	0
F	44,410	1,400	340	0
G	44,410	1,400	340	0

Consequences

In Alternatives A, B, and D, a large part of the central core of the area is managed intensively for timber development. Although some areas greater than 5,000 acres remain undeveloped, they are not suitable for Wilderness potential because of their shape and proximity to other activities. In Alternatives D, E, F, and G, the entire island is managed intensively for timber harvest. Because the suitable timber is scattered uniformly across the whole island, there is little chance that any areas would remain undeveloped.

(505) Soda Bay

Gross acres: 94,463
National Forest acres: 76,596

Description

The Soda Bay roadless area, characterized by low elevation and gently rolling topography, is located in the central part of Prince of Wales Island midway between the communities of Craig and Hydaburg which are connected by a road along the east boundary of the area. Other boundaries consist primarily of roads or land survey lines for private land. The coast is dominated by Trocadero and Soda Bays. The area is known to have been an important site for the indigenous Native culture. The Haida Native Corporation has made large land selections in the area which have been extensively logged. Primary recreation use of the area is hunting and fishing, with significant local subsistence use. There is a Forest Service trail and interpretive signs to draw attention to the limestone formations in Soda Bay. Waterfall Resort is on private land on the west side of the area. Craig's water supply facilities, located at North Fork Lake, are under special use authorization.

Wilderness Potential

With the exception of the North Fork Lake area, the interior
is unaltered. The opportunity for solitude is fair because of the possible sights and sounds of adjacent logging, and the likelyhood of meeting hunters and anglers. Most of the recreation potential centers around semi-primitive opportunities of the marine attractions in Trocadero and Soda Bays.

Resources

The area contains 29,318 acres of tentatively suitable forest land. The area has high value timber. Currently, Shelikof Island, off the south coast of the roadless area, is being logged and is visible. Short trails from the Prince of Wales Island road system to saltwater at Trocadero Bay would support excellent fishing and waterfowl hunting, as well as provide hiking. The area has high populations of Sitka black-tailed deer, bear, otter, marten, mink, loon, and common waterfowl. Potential for mineral development is very low. Management emphasis has been on dispersed recreation and fish habitat improvements. The area receives significant local use for subsistence and recreation activity which would likely continue or increase.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	38,500	19,280	29,250	0
B	48,750	9,020	29,250	0
C	81,310	5,450	260	0
D	58,050	4,270	24,700	0
E	81,310	5,450	260	0
F	81,310	5,450	260	0
G	81,310	5,450	260	0

Consequences

In Alternatives A, B, and D, almost the entire area is managed intensively for timber. The remaining undeveloped areas are small and fragmented, retaining no potential as Wilderness. In Alternatives C, E, F, and G, the entire area is managed intensively for timber, losing all future potential as Wilderness.

(507) Eudora

Gross Acres: 254,428
National Forest acres: 233,933

Description

The Eurdora roadless area is a remote area located on southeast Prince of Wales Island with rugged mountains in Cholmondeley Sound and a flat to moderate interior. Its western boundary coincides with the South Prince of Wales Wilderness, and its eastern boundary is saltwater. The east coast has a rich history of prehistoric and historic use by Native cultures and the Natives have made extensive land selections in the northern part. There is a wide variety of recreation use in the area, including cabins, mooring buoys, trails, and a number of mining claims and patents in the areas around Green Mountain, Bokan Mountain, Niblack Mountain, and all around Moria Sound. The many major sounds and bays provide bases for commercial fishing. Eudora is typical of southeast Alaska coastal temperate rain forests. The Big Creek drainage is considered an excellent example of old-growth wildlife. The area remains a significant site for subsistence hunting and fishing. The visual character of the area is mostly unaltered; however, the past and future Native harvests throughout the eastern half of Cholmondeley Sound have a significant impact on this highly scenic area.

Wilderness Potential

Native and State land selections, and the small mining patents, have not severely affected the natural integrity of the area. There is excellent opportunity for solitude, excluding the very northern fringe where the sights and sounds of logging and traffic may be evident. There are outstanding opportunities for primitive and semi-primitive recreation due to the high scenic quality, the vastness of the area, and the wide variety of recreation opportunities. The canoeing, kayaking and fishing opportunities are outstanding attractions.

Resources

The area contains 95,161 acres of tentatively suitable forest land. Timber potential is very high as almost all of the suitable land has good saltwater access. An important management consideration is that the Haida Native Corporation has the right for further land selections and they have interest in the northern third of the roadless area. The Big Creek-Chomondeley Sound area has been identified as a potential Research Natural Area. There is some opportunity to increase developed recreation facilities with additional cabins and new trails, as there is good road access to its northern boundary, and good boat access from the Ketchikan area. Mineral development potential is high. There is excellent potential to enhance the salmon spawning habitat on many streams within Eudora. The substantial subsistence use would likely continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	72,640	49,370	85,370	26,560
B	112,060	21,760	97,990	0
C	128,920	61,820	41,070	0
D	207,910	10,010	13,890	0
E	128,920	62,820	16,630	26,560
F	128,920	61,820	41,070	0
G	128,920	61,820	41,070	0

Consequences

In Alternative A, 26,560 acres around Kegan Lake are recommended as Wilderness, precluding mineral entry. An additional 85,000 acres, in three areas adjacent to the existing and proposed Wilderness retain their Wilderness potential. The remaining area is managed for a mix of uses, including road accessible recreation and timber harvest. In Alternative B over half the area is managed intensively for timber harvest, and does not retain Wilderness potential, while the Kegan Lake area and other small areas adjacent to the South Prince of Wales Wilderness are managed or semi-primitive recreation, retaining Wilderness potential. In Alternatives C, F, and G, the Wilderness potential is affected on about 75 percent of the area. Kegan Lake is managed for old-growth and retains Wilderness potential. In Alternative D, the entire area is managed for timber development, losing Wilderness potential. In Alternative E, the area is managed like Alternative C, except that the Kegan Lake area is recommended as Wilderness.

(508) Christoval
Gross acres: 7,750
National Forest acres: 7,750

Description

The Christoval roadless area, located on the southern tip of Heceta Island on the west coast of Prince of Wales Island, consists primarily of a single steep mountain (Bald Mountain). This extremely rugged forested area did not receive much historic development. The extensive amount of logging on Heceta Island on the opposite side of Bald Mountain ridge provided road access and is a major influence on this roadless area; however, since logging is near completion there should be less influence in the future. There are no constructed trails in the area and the only use by local residents is occasional hunting and some hiking out to the Bald Mountain ridge. Vegetation is typical southeast Alaska coastal temperate rain forest. Deer, bear, wolves, mink and bald eagles are the best known species in the area.

Wilderness Potential

There is good natural integrity in the area due to its coast line boundary and the rugged, mountainous terrain. Because access is difficult, an excellent opportunity for solitude exists, except that logging sights and sounds may be evident near the boundary. Due to past logging and roading, the area is more appropriate for semi-primitive motorized or semi-primitive non-motorized recreation.

Resources

The area contains 5,803 acres of tentatively suitable forest land. The rugged terrain over much of the area limits the opportunity for management of its resources, particularly the timber. The areas which are economically feasible are included in the next five-year plan for Ketchikan Pulp Company Long Term Sale. There is potential for a trail system into the Bald Mountain area from logging roads on the opposite side of the ridge. Although there is some potential for salmon enhancement projects, the difficult access is a limiting factor. The mineral potential is low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	300	3,810	3,630	0
B	3,010	1,100	3,630	0
C	7,130	560	60	0
D	6,950	540	260	0
E	7,130	560	60	0
F	7,130	560	60	0
G	7,130	560	60	0

Consequences

In Alternatives A and B, about half the area is managed for development, including timber harvest, losing its potential for Wilderness. The remaining areas are small and fragmented, precluding them from Wilderness potential. In the other alternatives, the entire area is managed for intensive development, and there is not potential for Wilderness.

(509) Kogish

Gross acres: 85,872
National Forest acres: 76,175

Description

The Kogish roadless area is located on the west side of central Prince of Wales Island. Extensive timber harvest continues to occur on the north and west sides of the roadless area, while Native lands to the east have been completely logged over. The more scenic areas are concentrated around the relatively rugged and diverse terrain of Kogish Mountain and Staney Cone, and the intricate shorelines and island groups in Salt Lake Bay and Nossuk Bay. There is very little evidence of prehistoric or historic use of this roadless area. The area is typical of southeast Alaskan temperate rain forest. There are populations of deer, bear, wolves, mink and bald eagles and there is good alpine habitat for ptarmigan. The only use by local residents is for occasional hunting. There are no improved trails in the area.

Wilderness

Even though roading and logging have occurred on all sides, natural integrity of the area is very good. Because of its difficult access, there is excellent opportunity for solitude, except for logging sights and sounds near the boundaries. The fishing and solitude along the streams in the southwestern portion of the area are an attraction. There are no outstanding opportunities for primitive recreation. Most recreation attractions are associated with the saltwater bays, anchorages, and channels on the west side where the experience level is primarily semi-primitive motorized.

Resources

The area contains 32,775 acres of tentatively suitable forest land. The rugged terrain limits the opportunity for management of its usable resources, particularly the timber. The 1989-94 Operating Period EIS for the KPC long term sale approved the harvest of 2,026 acres near Kogish Mountain, Staney Cone, upper Staney Creek and Shaheen Creek, affecting the character of about 10% of the roadless area. The Staney Creek and Shaheen Creek drainages have been proposed as Experimental Forests. The rugged terrain and very difficult access severely constrain its recreation potential, but the western and southern boundaries which border saltwater have potential for shelter sites and boat anchorages for use by small boats and kayaks. The geology of the area indicates some potential for discovery of valuable minerals.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	31,340	44,660	9,830	0
B	40,890	35,270	9,670	0
C	81,620	4,170	40	0
D	76,280	4,110	5,440	0
E	81,620	4,170	40	0
F	81,620	4,170	40	0
G	81,620	4,170	40	0

Consequences

In all alternatives, the vast majority of the area is managed for moderate development, including timber production, totally precluding Wilderness potential. In Alternatives A and B, a portion of the area is managed as an Experimental Forest, designation of which would be incompatible with future consideration as Wilderness.

(510) Karta
Gross acres: 129,664
National Forest acres: 121,440

Description

The Karta roadless area is located in the center of the east side of Prince of Wales Island and at the west end of Kasaan Bay which is the main water access route to POWI. The north, west, and south sides are accessible by road. Salmon Lake, Karta Lake, and the Karta River (a major west to east drainage) form the principal water system within the area. There are known prehistoric village sites, rock art, and other physical evidence of cultural history. More recently, there has been considerable mineral exploration and active mining. The very rugged rock forms of the Klawock Mountains are an outstanding scenic feature. The area has typical southeast Alaska coastal temperate rain forest and high populations of deer, bear, otter, marten, mink, loon, and common waterfowl. The area receives substantial subsistence and recreation use. There are five recreation use cabins and eight miles of trail within the area.

Wilderness Potential

The natural integrity of the area is very good. Between late June and September there is limited opportunity to find true solitude within the Karta River drainage due to heavy cabin use, floatplane traffic, and trail use. There is more opportunity for solitude on the alpine ridges that rim the Karta River basin. The Karta River drainage provides good opportunity for semi-primitive to primitive recreation, however, the extensive timber harvest on both Native and National Forest lands bordering the rest of the area limits it to roaded modified or semi-primitive motorized experiences.

Resources

The area contains 51,601 acres of tentatively suitable forest land. The entire area is within the primary sale area for the KPC Long Term Sale, and 5,647 unroaded acres in between the Karta and Thorne river drainages was approved for harvest in the 1989-94 Operating Period EIS. The area has been proposed as wilderness in pending congressional action. The increasing popularity and use of the area could cause some future difficulty in managing it as a wilderness. The current emphasis is to manage the area at about the present use level, emphasizing recreation, fish and wildlife habitat. Outfitters and guides would be limited and no additional cabins are planned. There are some possibilities for trails. The area has outstanding fish habitat and the Karta River is recognized as one of the outstanding sport fishing streams in southeast Alaska. There is the possibility that the Flagstaff mine could reopen or that other old claims would become viable mines in the future.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	35,270	40,860	9,430	39,670
B	42,710	33,420	49,100	0
C	64,380	20,530	40,330	0
D	88,020	17,890	19,330	0
E	64,200	20,490	880	39,670
F	64,200	20,490	40,550	0
G	64,300	20,490	40,450	0

Consequences

In Alternative A, the area around Salmon Lake is recommended as Wilderness, precluding mineral entry. The northern half of the area is managed for intensive and moderate development. In Alternatives B, C, F, and G, the Salmon Lake area is managed for old-growth and primitive recreation, retaining its Wilderness potential. The northern half of the area is managed for timber harvest, precluding mineral entry. In Alternative D, most of the area is managed intensively for timber harvest, except for a small area immediately around Salmon Lake which retains marginal potential for Wilderness. In Alternative E, the area around Salmon Lake is recommended as Wilderness, precluding mineral entry. The rest of the area is mainly managed for intensive timber harvest, losing its Wilderness potential.

(511) Thorne River
Gross acres: 112,460
National Forest acres: 112,460

Description

The Thorne River roadless area includes a large part of the center of Prince of Wales Island and almost all of the Thorne River drainage. The southern boundary is formed by State Highway 929 and Forest Road 30 connecting the communities of Thorne Bay and Craig. Access to the interior is by floatplane or canoe for skilled boaters only. Notable features include the area around Snakey Lakes, an intricate complex of narrow, winding freshwater bodies north of the main Thorne Lake drainage, and the many areas of grassy meadows and large stands of spruce in portions of the Thorne River. Aboriginal cultures probably used the lower reaches of the Thorne River for subsistence use. Vegetation is typical southeast Alaska temperate rain forest. There are high populations of deer, bear, otter, marten, mink, loon, and common waterfowl. The Thorne River and lakes in the areas are known resting places for migrating trumpeter swans. One recreation use cabin is located at Honker Lake. The trail/canoe system within the area is frequently used. The area receives significant local use for subsistence and recreation activities.

Wilderness Potential

Very good opportunities for solitude exist within the area, excluding the very fringe where the sights and sounds of logging and traffic may be evident. Due to the many lake and stream oriented attractions, and the remoteness of the area, the interior offers outstanding opportunities for primitive recreation. The canoeing and fishing, especially along the various segments of the Thorne River, are major attractions.

Resources

The area contains 54,972 acres of tentatively suitable forest land. Located within the KPC Long Term Sale area, it is likely that harvest entries will continue to be made into the existing unroaded area using the extensively roaded periphery. The 1989-94 Operating Period EIS for the KPC Long Term Sale approved the harvest of 5,135 currently unroaded acres in the vicinity of the North Thorne River and Slide Creek. Current management emphasis for Thorne River, Honker Divide, and Snakey Lakes area is for primitive recreation. Future planning is centered upon completing a system of canoe routes and portages, and identifying good campsites. However, since the area requires considerable wilderness skills, it may not be developed in the foreseeable future. This roadless area has outstanding fish habitat and with fish passes salmon could reach high quality spawning habitat that is currently unavailable. The potential for finding and developing minerals is low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	49,890	28,240	34,330	0
B	54,810	23,960	33,690	0
C	64,630	47,650	180	0
D	83,370	5,840	23,240	0
E	64,630	47,650	180	0
F	64,630	47,650	180	0
G	64,630	47,650	180	0

Consequences

In Alternative A and B, two thirds of the area is managed for timber development. Two areas, the main stem of the Thorne River and north of the Control Lake area which contain the primary recreation attractions in the roadless area, retain their potential for Wilderness. In Alternatives C, E, F, and G, the entire area is subject to intensive and moderate development, including timber harvest, with essentially no potential as Wilderness. In Alternative D, most of the area is managed for timber harvest, except for two small areas (upper Thorne River and north of Control Lake) which retain marginal potential as Wilderness because of their small size and the influence of adjacent timber harvest.

(512) Ratz

Gross acres: 8,349
National Forest acres: 8,349

Description

The Ratz roadless area is located on the east side of Prince of Wales Island approximately 15 miles north of Thorne Bay. The area is characterized by very rugged terrain, which is a well-defined ridge, except for the uplands west of Ratz Harbor where the topography is flat wetlands and muskeg. Aboriginal use has not been confirmed through cultural resource investigations. The entire area is bounded by roads and timber harvest units, or saltwater. The major scenic features are the diverse alpine terrain and small lakes near the summit of Baird Peak. The area is typical southeast Alaska coastal temperate rain forest. There are populations of deer, bear, and a scattering of other animals and birds common to Prince of Wales Island. Alaska Telecom's electronics site on Baird Peak is authorized by special use permit. The area receives light use by local people for recreation and subsistence.

Wilderness Potential

About half of the area has been unaltered by human activity, but due to extensive timber harvest around the periphery, the rest is moderately to heavily-altered visual condition or where the alterations create glaring contrasts with the natural landscape. The area does have good natural integrity and, except for during logging season, the opportunity for solitude is good. Due to its small size and current logging activities, the potential for primitive recreation experiences is limited.

Resources

The area contains 4,146 acres of tentatively suitable forest land. Although the area is within the primary sale area for the KPC Long Term Sale and there are harvest units planned, the rugged terrain limits plans for resource management. The area is important as unaltered wildlife habitat adjacent to extensive timber harvest areas. There is relatively low potential for recreation development in the area, although some hiking trails to small alpine lakes have potential. Streams and lakes are supporting fish populations at about the optimum level. The potential for mineral development is low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,340	2,710	4,300	0
B	2,100	1,940	4,300	0
C	4,120	3,960	260	0
D	6,750	340	1,260	0
E	4,120	3,960	260	0
F	4,120	3,960	260	0
G	4,120	3,960	260	0

Consequences

In Alternatives A and B, about half the area around Ratz Harbor is managed for primitive recreation, retaining minimal potential for Wilderness. In Alternatives D, E, F, and G, most of the area is managed intensively for timber, while the Ratz Harbor area is managed for moderate development, with no potential for Wilderness. In Alternative D, the entire area is managed for intensive timber development, losing all potential as Wilderness.

(513) Sweetwater
Gross acres: 11,104
National Forest acres: 11,104

Description

The Sweetwater roadless area is located on the east side of Prince of Wales Island approximately 15 miles north of Thorne Bay. The area, which primarily includes the broad, unroaded ridge tops between the Sweetwater and Luck Lake basins, is entirely bounded by roads and timber harvest units. Aboriginal use has not been confirmed through cultural resource investigations. Trumpeter Lake, near the alpine zone of the ridge, is probably the most significant natural feature. The vegetation is typical southeast Alaska coastal temperate rain forest. The area has populations of deer, bear, and a scattering of other wildlife species common to Prince of Wales Island. The area is not known to be of significant interest to local residents and is not used for recreation other than for some deer hunting.

Wilderness Potential

This roadless area is unaltered, though the periphery has been heavily modified. Within the area, the opportunity for solitude is excellent. The limited size of the area, the proximity to timber harvest areas, and the limited number of recreation attractions result in limited primitive recreation potential.

Resources

The area contains 5,382 acres of tentatively suitable forest land. Although the area is within the primary sale area for KPC Long Term Sale, the rugged terrain and the general lack of commercial timber limits resource management potential. The current 1989-94 Operating Period EIS for the KPC long term sale approved harvest of 549 unroaded acres east of Sweetwater Lake and in upper Coffman Creek. The area is important as unaltered wildlife habitat adjacent to extensive timber harvest areas. Due to the minimal recreation attractions, the recreation potential is relatively low. Identified alpine hiking opportunities lead from the Trumpeter Lake area, and good hunting opportunities possibly exist. Mineral development potential is low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	560	5,140	5,400	0
B	2,880	4,000	4,220	0
C	5,740	5,360	0	0
D	9,160	480	1,460	0
E	5,740	5,360	0	0
F	5,740	5,360	0	0
G	5,740	5,360	0	0

Consequences

In Alternative A, the area around Sweetwater Lake retains marginal potential for Wilderness. The remaining area receives varying degrees of development, including timber harvest. In all other alternatives, the area is managed for intensive and moderate development, including timber harvest, precluding all potential for Wilderness.

(514) Sarkar

Gross acres: 73,725
National Forest acres: 73,565

Description

The Sarkar roadless area is located on the north end of Prince of Wales Island and is bounded on three sides by extensive roaded and logged areas. A small segment of the eastern boundary is saltwater. The pending Native land selections at South Neck Lake and South Whale Pass have been excluded from this area, but do form part of its boundary. This area, used by prehistoric and historic Native cultures, contains what may be one of the larger known Native summer camps. Two traditional-use Native sites have been conveyed to Native Corporations in accordance with ANILCA. There are three recreation-use cabins and an associated trail system located at Barnes, Sweetwater, and Sarkar Lakes. The Sarkar Lake chain has a long history of subsistence and recreation use and is known for past and present use as a canoe route. The area is typical southeast Alaska coastal temperate rain forest and has populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Sarkar Lake is a wintering area for trumpeter swan. The area receives significant local use for subsistence and recreation activity.

Wilderness Potential

The natural integrity of the area is good and most of the area has remained unaltered by human activity. There is very good opportunity for solitude within the area, except for the sights and sounds of logging on the very fringe. Other recreationists or subsistence users may be encountered during the summer. Excellent primitive recreation opportunities exist, particularly in the northern end of the Sarkar Lakes chain due to the remoteness and solitude of the area and to its outstanding canoeing, fishing and camping opportunities.

Resources

The area contains 33,335 acres of tentatively suitable forest land. Although the area is in the primary sale area for the KPC Long Term Sale, it cannot be easily managed for timber production because of the large number of lakes, streams, and riparian areas, and because the timber is arranged in small dispersed stands. The area is important for wildlife as a place of unaltered habitat within a much wider area of extensive timber harvest. The area has been identified as proposed wilderness in pending Tongass reform legislation and is under consideration as a Research Natural Area. The area has considerable potential for developed and dispersed recreation activity, including trail construction and canoe portages in the Sarkar Lakes area, and additional recreation cabins throughout this area. Currently, no mining or known prospecting is occurring within this roadless area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	20,860	8,420	18,880	25,406
B	31,450	9,780	32,330	0
C	20,940	25,220	27,410	0
D	68,980	3,580	1,000	0
E	20,940	25,220	2,000	25,406
F	20,940	25,220	27,400	0
G	20,940	25,220	27,400	0

Consequences

In Alternatives A and E, the core of the area including the Sarkar Lakes area, is recommended as Wilderness and as a Research Natural Area. In Alterantive A, the area around Barnes Lake is managed for old-growth. The remaining area is managed for timber development. In Alternative B, F, and G, the core of the Sarkar Lakes area is managed for old-growth, primitive recreation, and as Research Natural Area, retaining its Wilderness potential. The rest of the area is managed for timber development, losing Wilderness potential. In Alternative D, the entire area is managed for intensive development for timber production, and retains no Wilderness potential.

(515) Kosciusko

Gross acres: 70,597

National Forest acres: 70,216

Description

The Kosciusko roadless area is within the low mountain arc of the Pacific Mountain system and is located off the northwest end of Prince of Wales Island. It is surrounded by roaded and logged areas, including its southwest boundary, while saltwater forms the rest of its boundary. The coastal area was used by prehistoric and historic Native cultures, while Russians used the west coast for trading. Outstanding features include the landscape around Mount Francis, the highly diverse terrain around the The Nipples and particularly the Odd Rock Creek drainage with its dramatic steep slopes enclosing scenic meadows. Vegetation is typical southeast Alaska coastal temperate rain forest. Sitka black-tailed deer, black bear, wolves, mink, and blad eagles are the best known species inhabiting the area. There are no trails, but there is one recreation cabin at Shipley Bay. Use by local residents is primarily for excusisons into the many bays and inlets for general boating, fishing, and hunting. Subsistence use exists in the area.

Wilderness Potential

There is high opportunity for solitude within the area, except for the very fringe where the sights and sounds of logging may be evident. The rugged terrain with many isolated lake or alpine basins enhances the opportunity for solitude. Several portions of this area provide excellent opportunities for primitive recreation due to their remoteness and their many scenic and recreation attractions, including lakes, scenic alpine areas, and protected saltwater bays.

Resources

The area contains 38,621 acres of tentatively suitable forest lands. The entire roadless area is within the primary sale area for the KPC Long Term Sale, but the central part is recommended as Wilderness in pending Tongass legislation. The area could easily be managed for timber production since the existing peripheral area has an extensive logging road network and there is ample opportunity to construct log transfer facilities. The area is important unaltered habitat for wildlife within a much wider area of extensive timber harvest. Recreation use is low in the area due to its remoteness, however there is significant potential for developed and dispersed recreation activity, including trail construction, additional cabins, and anchor buoys. El Cap Pass and Dry Pass, on the eastern and northern borders, are part of an identified kayak route along the west coast of Prince of Wales Island. One inactive mining claim is located within the area and potential exists for development of the limestone and marble resources.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	1,770	5,920	7,610	54,920
B	7,970	2,770	59,470	0
C	66,180	3,670	360	0
D	65,800	3,670	740	0
E	14,410	760	120	54,920
F	14,410	760	55,040	0
G	51,100	2,830	16,280	0

Consequences

In Alternative A, almost the entire area is managed for Wilderness. In addition, the area around Shipley Bay is managed for old-growth and retains it Wilderness potential. In Alternative B, most of the area is managed for primitive recreation or old-growth, retaining its Wilderness potential. Two areas, along El Capitan Passage and around Shipley Bay, are managed for intensive timber development, and do not retain any potential for Wilderness. In Alternative C and D, the entire area is managed for timber development, not retaining any Wilderness potential. In Alternative E, the majority of the area is managed as Wilderness, except for a small area managed intensively for timber north of Davidson Bay. In Alternative F, the majority of the area is managed for old-growth or primitive recreation, except for the same area as in Alternative E, which is managed intensively for timber. In Alternative G, the majority of the area is managed intensively for timber, precluding Wilderness potential, except for the area around Shakan Bay.

(516) Calder

Gross acres: 12,687
National Forest acres: 12,687

Description

The Calder roadless area is located on the northwest end of Prince of Wales Island and includes a number of major and minor islands in Shakan Bay. It is bounded on the north and east by roaded and harvested areas, and the Pacific Ocean and Shakan Bay form Calder's western and southern boundaries. Aboriginal peoples used the bay and its islands as a homesite. Special features include the prominent peak of Mount Calder, the numerous offshore islands, a limestone formation which may have large caves, and the overall island environment. Vegetation is typical southeast Alaska coastal temperate rain forest. There are populations of deer, bear, wolves, mink, and bald eagles in the area. There is a State selected parcel in the southeast portion of the area on the east shore of Shakan Bay. There are no improved trails or recreation-use cabins within the area. Use by local residents is primarily excursions into Shakan Bay by boat for subsistence and recreation purposes.

Wilderness Potential

The extensive logging on the eastern and northern edges of this area, including the lower slopes of Mount Calder, significantly impacts the area's natural integrity. Due to the topography, the sight and sound of traffic and logging activities are not apparent from within most of the roadless area, so there is a high opportunity for solitude. Shakan Bay receives considerable use by the fishing fleet and recreation boaters. The area provides primarily a semi-primitive recreation opportunity, however, recreation use is low on land and island areas.

Resources

The area contains 9,575 acres of tentatively suitable forest land. The entire roadless area is included within the primary sale area for the KPC Long Term Sale and has also been proposed as wilderness in pending Tongass legislation. The area could be easily managed for timber production since the existing peripheral area has an extensive logging road network and the necessary sites for log transfer facilities. The area is important for wildlife as a place of unaltered habitat within a much wider area of extensive timber harvest. Good potential exists for developed and dispersed recreation activities, including construction of trails, cabins, and saltwater buoys and docks. An identified potential kayak route goes through the islands along the west coast of Prince of Wales Island. Mineral potential may be important because of the known, but undeveloped, deposits of marble located in the south part of the area.

Prescription

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	740	1,970	9,980
B	400	340	11,940	0
C	11,900	760	20	0
D	11,820	760	100	0
E	2,550	160	0	9,980
F	2,550	160	9,980	0
G	6,160	400	6,120	0

Consequences

In Alternatives A and E, the majority of the area is recommended as Wilderness. In Alternative A, a small portion is also recommended as a Research Natural Area, but in Alternative E it is managed for intensive timber development. In Alternative B, the area is managed for semi-primitive recreation and Research Natural Area, retaining potential as Wilderness. In Alternatives C and D, the area is managed for intensive timber development, losing potential as Wilderness. In Alternatives F and G, varying portions of the coastal areas and islands are managed as primitive recreation, retaining moderate potential as Wilderness.

(517) El Capitan

Gross acres: 43,644
National Forest acres: 43,604

Description

The El Capitan roadless area, located on the north end of Prince of Wales Island, is within the large limestone formation occurring on this part of POWI. The area is characterized by low elevation but rugged terrain, numerous small streams which drain into Red Lake (the largest within the area), and no saltwater shoreline. Roaded and harvested areas are on the north, west, and south sides, while a road forms the eastern boundary separating El Capitan from the Salmon Bay roadless area. The area was used by prehistoric and historic Native cultures. Vegetation is typical southeast Alaska coastal temperate rain forest. Deer, bear, wolves, mink, and bald eagles are the best known species inhabiting the area. Fishing and solitude of the Red Lake area, which has one recreation cabin at the north end, are attractions. There are no improved trails in the area. Use by local residents is primarily subsistence, and excursions into Red Lake for fishing and cabin use.

Wilderness Potential

The existence of extensive timber harvest along the edge of this area is quite dominant and significantly reduces its natural integrity. Excluding the very fringe where the sights and sounds of logging and traffic may be evident, there is a high opportunity for solitude. Floatplanes are used to transport people to the Red Lake cabin. The area primarily provides semi-primitive recreation opportunities, most of which are located around Red Lake and its alpine areas, and Red Bay Mountain and El Capitan Peak.

Resources

The area contains 23,316 acres of tentatively suitable forest land. The entire area is included within the primary sale area for the KPC Long Term Sale, and 3,028 unroaded acres was approved for harvest in the 1989-94 Operating Period EIS in Marble Creek, Big Creek and Alder Creek around the perimeter of the area. These new roads and harvest areas reduce the wilderness potential on about 15% of the area. The area has also been proposed as wilderness in pending Tongass legislation. The area could easily be managed for timber production since the existing peripheral area has an extensive logging road network and the necessary sites for log transfer facilities. The area is important for wildlife as a place of unaltered habitat within a much wider area of extensive timber harvest. Some potential for developed recreation activity exists, including trail construction and possibly another cabin at Red Lake. The caves which have been located in the limestone formations on the west side of the area may have national significance and could provide a unique opportunity to develop destination recreation facilities with interpretive and viewing experiences. There are marble formations in the southwest corner of the area, however no current mining or prospecting currently exists.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	10,100	14,210	19,290	0
B	21,400	9,630	12,580	0
C	29,990	13,600	20	0
D	41,180	2,380	40	0
E	29,990	13,600	20	0
F	29,990	13,600	20	0
G	29,990	13,600	20	0

Consequences

In Alternative A, about half the area is managed for a mix of moderate and intensive development, including timber harvest, losing its Wilderness potential. The area around Red Lake drainage is managed for old-growth and retains its Wilderness potential. In Alternative B, the majority of the area is managed for timber development, losing its Wilderness potential. The area around Red Lake maintains marginal Wilderness potential. The other alternatives are essentially managed for intensive development, without retaining any potential for Wilderness.

(518) Salmon Bay

Gross acres: 36,426

National Forest acres: 36,426

Description

The Salmon Bay roadless area, characterized by low elevation mountains with steep slopes, is located on the north end of Prince of Wales Island. The area is bounded on three sides by roaded and logged areas, while a road forms the west boundary separating it from the El Capitan roadless area. The coastal portion was used by prehistoric and historic Native cultures, and Salmon Bay was the site of fish canneries in the early 1900's. Fish inventories show numerous streams which are high quality salmon spawning habitat. These streams and Salmon Bay Lake also contain rainbow trout. Vegetation is typical southeast Alaska coastal temperate rain forest. Deer, bear, wolves, mink and bald eagles inhabit the area. The outstanding stream and lake fishing and solitude of the Salmon Bay Lake area are attractions. One improved trail exists in this area - from near the cabin at the outlet to Salmon Bay Lake downstream toward the bay. Use by local residents is primarily excursions into Salmon Bay Lake using the cabin as a base for fishing. Subsistence use in the area is minor.

Wilderness Potential

Most of the natural landscape remains unaltered by human activity and the natural integrity is good. There is presently a good opportunity for solitude within the area. Logging is planned for some areas near Salmon Bay Lake and the sights and sounds of it will periodically be heard from the lake. Floatplanes are used to transport people to the recreation cabin Although there are outstanding recreation opportunities in the area, the proximity of these attractions to on-going logging does not permit a strictly primitive recreation experience. Recreation use is low in the area.

Resources

The area contains 15,881 acres of tentatively suitable forest land. The entire roadless area is within the primary sale area of the KPC Long Term Sale and could easily be managed for timber production since the existing peripheral area has an extensive logging road network and the necessary sites for log transfer facilities. The 1989-94 Operating Period EIS for the KPC long term sale approved 1,997 acres for harvest along the west side of the area and south of Salmon Bay Lake, which will affect wilderness potential on about 20% of the area. The area is important for unaltered wildlife habitat within a much wider area of extensive timber harvest. There is potential for additional trails connecting Salmon Bay Lake to saltwater and connecting the logging road system to the southern end of Salmon Bay Lake. There is potential for one additional recreation cabin at Salmon Bay Lake and also good potential to manage for low density primitive recreation experiences.

Because of the known but undeveloped deposits of rare earth minerals located in the northern part of this roadless area, mineral management may be of potential importance.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	9,040	9,000	18,420	0
B	17,510	5,680	13,180	0
C	8,260	27,220	890	0
D	34,050	2,190	120	0
E	8,260	27,220	890	0
F	8,260	27,220	890	0
G	8,260	27,220	890	0

Consequences

In Alternatives A and B, about half the area surrounding Salmon Bay Lake is managed for semi-primitive recreation, retaining its Wilderness potential. The rest of the area is managed for a mix of development uses, including timber harvest. In Alternative C, E, F, and G the area surrounding Salmon Bay Lake is managed with an emphasis on recreation, but allowing a moderate level of development, including harvest. In Alternative D, the entire area is managed intensively for timber development, losing all potential for Wilderness.

(519) Polk

Gross acres: 173,024
National Forest acres: 149,205

Description

The Polk roadless area, which has historically been the entry to Prince of Wales Island, is located on the east-central part of Prince of Wales Island. Access is by the Alaska Marine Highway System through Hollis, by the extensive road system around the roadless area, by boat through Kasaan Bay and Skowl Arm, and by floatplane. These convenient accesses to the excellent fishing and hunting grounds, and the close proximity to Ketchikan, cause the area to receive higher use by people than most other places on POWI. The shoreline of Skowl Arm and Cholmondeley Sound is very irregular and possesses many scenic coves, and there are many freshwater lakes. The Polk Inlet and Twelve-Mile Arm areas were important locales of prehistoric and historic traditional use by the Haida Natives. The Haida Native Corporation made large land selections in this area, and further ones are anticipated before 1995. There is an existing Research Natural Area in the Old Tom Creek drainage, a fishing lodge in Clover Bay, and a recreation cabin at Trollers Cove. This area is typical southeast Alaska coastal temperate rain forest and also has high populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Local residents use the area for subsistence and extensively for recreation.

Wilderness

Because of the irregular pattern of intrusion caused by past and present logging, and by Native and State land selections, the natural integrity of the area is not ideal. The opportunity for solitude within this area is generally good to excellent on the eastern half. On the western half, because of logging, boating, and recreationists, the opportunity becomes marginal. Due to the many saltwater and upland recreation opportunities there are excellent opportunities for primitive recreation, particularly in the eastern half of the area.

Resources

This area contains 53,605 acres of tentatively suitable forest land. It is in the primary sale area of the KPC Long Term Sale. Timber harvest has been occurring around its perimeter for many years and plans are for harvest to continue. The 1989-94 Operating Period EIS for the Ketchikan Pulp Company Long Term Sale approved 2,187 acres of harvest around Polk Inlet and throughout the Old Frank's Creek drainage. There is great opportunity to manage this area for developed and dispersed recreation in a semi-primitive to primitive setting, including a campground at the head of Twelve-Mile Arm, trails in the west half and trails from the many protected coves along the east side to the various lake basins just east of the coastline.

The potential is very good for land or water based fishing resorts. The area has excellent potential for salmon enhancement projects, such as fish passes, on several of the streams. Mineral development potential is very low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	28,660	38,420	82,120	0
B	51,580	15,500	82,120	0
C	128,780	15,080	5,350	0
D	120,280	6,690	22,240	0
E	128,780	15,080	5,350	0
F	128,780	15,080	5,350	0
G	128,780	15,080	5,350	0

Consequences

In all alternatives, the Old Tom Creek Research Natural Area retains its natural characteristics. In Alternatives A and B, two areas are managed for semi-primitive recreation, along Skowl Arm and the Cabin Creek drainage, retaining their potential for Wilderness. The rest of the area is managed for a mix of moderate and intensive development, including timber harvest, not retaining any Wilderness potential. In Alternatives C, E, F, and G the entire area is managed primarily for intensive timber harvest, not retaining Wilderness potential. Alternative D is similar to Alternatives C, E, F, and G, except for some small areas which do not meet the minimum size criterion for consideration as Wilderness.

(520) Kasaan

Gross acres: 8,676
National Forest acres: 8,536

Description

The Kasaan roadless area includes the mountainous southern tip of the Kasaan Peninsula and low-lying Grindall Island which are located on the east-central side of Prince of Wales Island. The area is bounded on the north by Native Corporation land, while the rest of the boundary is made up of Clarence Strait and Kasaan Bay making this a very isolated piece of National Forest. In addition, the State has nominated Grindall Island, which has sea lion rookeries off its south side, and sites on the peninsula for selection. The records show that this area did not have much in the way of prehistoric or historic human activity and continues to receive little use, although the one recreation cabin at Grindall Island is used by local people. The vegetation is typical coastal southeast Alaska temperate rain forest. The area has high populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Alpine areas are excellent ptarmigan habitat.

Wilderness Potential

The entire area has remained unaltered by human activity which gives the area good natural integrity. However, once the State land selections are concluded, the area will be fragmented and the key feature, Grindall Island, will be in State ownership. The area does not provide the opportunity for solitude because the entire area is in close proximity or overlooks the shipping and marine channels of Clarence Strait and Kasaan Bay. The area provides primarily primitive recreation opportunities.

Resources

The area contains 3,227 acres of tentatively suitable forest land. However, due to its rugged terrain, limited coastal access, and isolation, resource management is restricted. The recreation potential is limited to the one cabin, and the State is nominating all land areas suitable for any future recreation purpose. Due to the lack of freshwater streams, this area has little value for fish resources. The mineral potential within the area is considered to be low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	5,290	3,250	0
B	0	5,290	3,250	0
C	0	6,310	2,230	0
D	7,110	200	1,220	0
E	0	6,310	2,230	0
F	0	6,310	2,230	0
G	0	6,310	2,230	0

Consequences

In all alternatives, except Alternative D, the area is managed for moderate development except for the area on the tip of the peninsula which has the Forest Service cabin. In Alternative D, the entire area is managed intensively for timber harvest. No Wilderness potential remains in any alternative.

(521) Duke

Gross acres: 46,845
National Forest acres: 46,785

Description

The Duke Island roadless area consists of Duke, Mary, and Percy Islands which are located about 10 miles southeast of Annette Island and 10 miles west of Misty Fiords National Monument across Revillagigedo Channel. The islands are exposed to the frequent severe weather out of Dixon entrance. The Judd Bay area on Duke island is used as a safe anchorage for fishing vessels, and 2,170 acres of land have been selected by the State at Judd Harbor. The islands were used by Alaska Natives in both ancient and historic times. The isolation and the rugged coastline interspersed with sandy beaches, plus the opportunity to view sea birds and mammals, are the special features of this roadless area. The islands are forested with poor quality hemlock, spruce and cedar. Duke Island has a fox population, some deer, and along the shoreline, the common sea mammals of southeast Alaska.

Wilderness Potential

With its essentially unapproachable shoreline, this area is unmodified and has excellent natural integrity. There is outstanding opportunity for solitude. There is good opportunity for primitive recreation, primarily along the coastal areas, however there are no recreation attractions inland such as lakes, streams, or alpine features.

Resources

The area contains 7,695 acres of tentatively suitable forest lands. The lack of quality timber, absence of fresh water, and lack of safe access preclude any active management of the resources on these islands. A few skilled boaters do land on the island to beachcomb on the several sand beaches.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	46,780	0
B	0	0	46,780	0
C	20	0	46,760	0
D	0	0	46,780	0
E	20	0	46,760	0
F	20	0	46,760	0
G	20	0	46,760	0

Consequences

In all alternatives, the entire area is managed for primitive recreation retaining its Wilderness potential.

(522) Gravina

Gross acres: 61,841

National Forest acres: 38,952

Description

The Gravina roadless area is located on Gravina Island across the Revillagigedo Channel from Ketchikan. The area is characterized by low elevation topography, a rugged backbone ridge, and muskeg flats. Access is by boat, floatplane, or hiking through State land after taking the public airport ferry. Gravina Island is heavily influenced by the growth in the greater Ketchikan area which supports an airport on the northern end of the island. State and Native land selections extend into the area causing an irregular boundary. Gravina Island was used by prehistoric and historic Native cultures, as well as by early settlers. The vegetation is typical southeast Alaska coastal temperate rain forest and also has a high population of Sitka black-tailed deer, some black bear, and some small furbearers. There is one recreation use cabin on the southwest coast, and an electronics site on High Mountain. Gravina Island has a long history of subsistence and recreation use by residents of Ketchikan.

Wilderness Potential

Because the area is surrounded primarily by large saltwater channels, the natural integrity of the area is preserved. The opportunity for solitude within the area is marginal due to the constant sights and sounds of sport and commercial fishing boats, floatplanes, and jets. However, one is not likely to meet another person within the area. There is good opportunity for primitive recreation in the interior of the island and along the southwest coast which has good fishing and a cabin. Some of these primitive opportunities may be impacted in the future by development on the extensive State and private lands in the area.

Resources

The area contains 16,578 acres of tentatively suitable forest land. The area has limited potential for commodity and market resource management. Potential for amenity values in terms of developed recreation, fish, and wildlife resources is also limited. A trail could be developed connecting the east side of Gravina along Tongass Narrows to Bostwick Lake and Inlet or to Blank Inlet. The State would be involved in this development. The southern end of Gravina Island has a history of mineral exploration and gold mining. Prospecting is occurring and there is potential for future mine development. Current recreation and subsistence use would likely continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	38,950	0
B	0	0	38,950	0
C	0	0	38,950	0
D	0	260	38,690	0
E	0	0	38,950	0
F	0	0	38,950	0
G	0	0	38,950	0

Consequences

In all alternatives, the entire area is managed for semi-primitive recreation and old-growth habitat, retaining its Wilderness potential.

(523) South Revilla

Gross acres: 71,998

National Forest acres: 71,358

Description

The South Revilla roadless area is located on the southwest quarter of Revillagigedo Island. The boundaries of the area consist mostly of Misty Fiords National Monument and the saltwater areas of George and Carroll Inlets and Thorne Arm. The Forest Service camp, Coast Guard Loran station at Shoal Cove, the Sealevel Mine patent are excluded from the area's boundary. The area is characterized by a combination of steep mountain slopes and gentle terrain. Prehistoric and historic Native cultures used this roadless area but their primary influences are now within the private, Native and State lands. There is one recreation cabin, a mooring buoy, and a hiking trail at Fish Creek. The Fish Creek-Low Lake drainage at the head of Thorne Arm, and the cluster of lakes near the summit of Black Mountain, are scenic points. Vegetation is typical southeast Alaska coastal temperate rain forest. The area has populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Trumpeter swan use the major saltwater inlets and freshwater lakes as resting areas during migration. Primary uses of the area are for subsistence salmon fishing in Thorne Arm, some trapping, and much sportfishing in the streams and lakes.

Wilderness Potential

Most of the area has remained unaltered by human activity, except for some timber harvest primarily at the head of Thorne Arm. The natural integrity is good. There is excellent opportunity for solitude within most of this area, although during steelhead and salmon fishing seasons it is likely a person would encounter other individuals. The sights and sounds of aircraft can be heard almost anywhere in the area. Good opportunities for primitive recreation exist along the east shore of Thorne Arm and along potential trail corridors such as Gokachin Creek which lead into Misty Fiords National Monument.

Resources

The area contains 23,807 acres of tentatively suitable forest land. Timber sales are currently planned in the Elf Point area in Thorne Arm. Most of this roadless area, with the exception of the LUD 2 and Fish Creek drainage areas, is being considered for future timber entry. Some potential exists for additional recreation cabins and trails within the Thorne Arm part of this area. The Gokachin Lakes area has been recognized as an outstanding canoeing opportunity. The major streams provide excellent fish habitat and are widely known for high quality steelhead and salmon fishing. The major lakes within the Fish Creek drainage have very good stocks of rainbow trout. Although no active mining is occurring at this time, there is interest in the mineral potential of the Black Mountain and Moth Bay areas. Recreation and subsistence use would likely continue.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	18,410	21,530	31,420	0
B	30,420	11,110	29,820	0
C	25,370	20,970	25,020	0
D	61,260	2,680	7,420	0
E	25,370	20,970	25,020	0
F	25,370	20,970	25,020	0
G	25,370	20,970	25,020	0

Consequences

In all alternatives, except Alternative D, two areas retain a limited potential for Wilderness and are located on Carrol Inlet across from Saxman and on Thorne Arm near Cone Point. The rest of the area is managed for a mix of development uses, including timber harvest, and do not retain any potential for Wilderness. In Alternative D, the entire area is managed for intensive timber development, not retaining any Wilderness potential.

(524) Revilla

Gross acres: 161,263
National Forest acres: 138,393

Description

The Revilla roadless area, characterized by rugged terrain, steep mountain slopes and numerous lakes, is located on the southwest quarter of Revillagigedo Island. The entire southern boundary of this area is influenced by the development associated with Ketchikan. This area is the source of Ketchikan's domestic water supply and part of its hydropower comes from the Swan Lake power generation facility. Extensive State and Native land selections north of Ketchikan, and in George and Carroll Inlets, create a very irregular boundary. Prehistoric and historic Native cultures used the area, but the main areas of influence are now within private, Native and State lands. There are two Forest Service campgrounds, picnic areas, and a trail at Ward Lake. Deer Mountain Trail is a National Recreation Trail. The Ward Lake drainage receives heavy winter recreation activity. The main attraction is that it is the only National Forest land area that is accessible by road from Ketchikan. The area is typical southeast Alaska coastal temperate rain forest. It has populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Trumpeter swan use the major inlets and lakes as resting areas during migration. The area receives significant local use for subsistence and recreation activity.

Wilderness Potential

The area has been modified by human activity connected with its close proximity to Ketchikan. There is opportunity for solitude within certain parts of the area, but along the southern edge there is noise from Ketchikan, and aircraft noise can be heard virtually everywhere. Opportunities for primitive recreation are also limited, however there are many semi-primitive attractions available.

Resources

The area contains 50,638 acres of tentatively suitable forest land. Future timber harvest is planned within this area in the upper parts of George and Carroll Inlets. This area has high potential for development of roaded recreation which is a priority objective for the people in the Ketchikan area. Plans include extending Ward Lake road into the upper end of George and Carroll Inlets; a long-range plan proposes connecting Ketchikan to the mainland with a road proceeding northward to the Bradfield Canal. Any extension must be through the Revilla unroaded area. Potential exists for trail construction, additional recreation cabins, and campgrounds within the area. There is some potential for fish habitat improvement, however the best opportunities are now within State and Native selected lands. There is some hunting and trapping in the area, but much of the terrain is too rough for quality sports hunting. There are mining claims located on Mahoney Mountain.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	23,110	36,170	77,880	0
B	35,310	39,220	62,620	0
C	48,300	67,250	21,600	0
D	82,720	17,990	36,440	0
E	48,300	67,250	21,600	0
F	48,300	67,250	21,600	0
G	48,300	67,250	21,600	0

Consequences

In all alternatives, the area adjacent to Ketchikan is managed for semi-primitive recreation and old-growth, retaining a moderate potential for Wilderness due to its proximity to the urban area of Ketchikan. In Alternative A, a small area near George Inlet retains some Wilderness potential. The remainder of the area is subject to moderate and intensive development, including timber harvest, precluding Wilderness potential. In Alternative B, an area near Swan Lake is managed for semi-primitive recreation, retaining its potential for Wilderness. The remainder of the area is subject to a mix of development uses, including timber harvest, precluding Wilderness potential. In Alternatives C, E, F, and G the remainder of the area is managed for a mix of development uses, including timber harvest, precluding Wilderness potential. In Alternative D, the majority of the remainder of the area is managed for intensive timber harvest, precluding Wilderness potential.

(525) Behm Islands

Gross acres: 5,526

National Forest acres: 2,042

Description

The Behm Islands roadless area includes a chain of islands extending from Point Higgins to Naha Bay offshore of the southwest corner of Revillagigedo Island. These islands form the sheltered water known as Clover Pass which has been designated a Scenic Recreation Area by the Ketchikan Borough. Although there are no highly distinctive scenic features, the combinatin of waterways, islands, and the backdrop of more massive landforms around this popular fishing and boating area make this a very attractive landscape. Prehistoric and historic Native cultures used these islands. There is one recreation residence authorized by a special use permit on Betton Island and there is one parcel of private land on Grant Island. There are U.S. Coast Guard navigation aids installed on several of the islands. The Navy has recently been authorized by the Forest Service to construct support buildings and a dock on Back Island for their acoustical test range to be located in Behm Canal. The area is typical southeast Alaska coastal temperate rain forest. There are few land mammals on these islands, but marine mammals are occasionally seen on or near rocks along the shoreline. The area receives insignificant use by the local residents or other users.

Wilderness Potential

A few small structures scattered throughout this area are the only alterations to the natural landscape. Several homes, marinas, and resort developments can be seen on the shore of Revillagigedo Island from many portions of this area. The Navy's acoustical test site will break the apparent natural integrity of Back Island. There is practically no opportunity for solitude within this area. During the summer there are the constant sights and sounds of powerboats. The area provides primarily roaded natural and semi-primitive recreation opportunities.

Resources

The area contains 1,361 acres of tentatively suitable forest land. Since the area is made up of small islands which have limited potential for timber harvest or other resource management activities, it could easily be managed in a roadless condition. This roadless area has minor potential for recreation development and use. There is some opportunity to provide unimproved or semi-improved rest/campsites for kayakers, however this island group is projected to remain a scenic backdrop to the significant amount of charter and independent fishing that occurs in the Clover Pass area. Sea mammals and birds will continue to use the shorline environment.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	5,530	0
B	0	0	5,530	0
C	0	0	5,530	0
D	0	1,720	3,800	0
E	0	0	5,530	0
F	0	0	5,530	0
G	0	0	5,530	0

Consequences

In all alternatives, the islands are managed for semi-primitive recreation and retain Wilderness potential.

(526) North Revilla

Gross acres: 164,810

National Forest acres: 163,771

Description

The North Revilla roadless area is located on the west coast of Revillagigedo Island and has a rich history in the development of southern southeast Alaska, including commercial fishing, homesteading, and a fish hatchery. Misty Fiords National Monument, Behm Canal and the Revilla roadless area form three of its boundaries, while the northwest boundary is the harvest areas of Gedney Pass, Neets Creek, and Traitors River. Mountain slopes are steep and the area is dominated by an extensive lake chain associated with the Naha River drainage which is managed for recreation use, including a boat dock, a small boat tram, the Naha Trail (which is a National Recreation Trail), and six recreation cabins. There is one cabin at the east end of Orchard Lake. Prehistoric and historic Native cultures' activities mostly centered in the Naha Bay area. Vegetation is typical southeast Alaska coastal temperate rain forest. The area has populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Trumpeter swans use the major inlets and lakes as resting areas during migration. The area receives significant local use for subsistence and recreation activity.

Wilderness

The natural integrity is good and the 400 acres of private inholdings do not significantly impact the area. There is opportunity for solitude within certain parts of the area, however one is likely to meet other people in the Naha area, near Orten Ranch, and around the cabins which are reached by floatplane. There are outstanding opportunities for primitive or near-primitive recreation experiences due to many remote and scenic attractions.

Resources

The area contains 61,763 acres of tentatively suitable forest land. The northern part of this roadless area has some timber management capability, although there no plans at this time to extend timber harvesting into the area. The long-term management intent for the North Revilla roadless area is to manage the Naha River drainage in its roadless condition with considerable emphasis on supporting the dispersed and developed (cabin) recreation use. The Naha River drainage has been proposed as wilderness in pending Tongass legislation and proposed as Wilderness in legislative initiatives. The area has potential for additional trails. There is some hunting and trapping within the area, but in general, the terrain is too rough for quality sports hunting. A potential road corridor connecting Ketchikan with the Canadian highway system, by way of Bradfield River, passes through the eastern part of this area. The potential for mineral development is considered to be low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	13,050	27,310	89,310	32,130
B	59,720	18,210	83,520	0
C	81,730	33,890	45,830	0
D	127,880	4,820	28,750	0
E	81,730	33,890	14,030	31,790
F	81,730	33,890	45,830	0
G	81,730	33,890	45,830	0

Consequences

In Alternatives A and E, the area around the Naha River drainage is recommended as Wilderness. In Alternative A, the Carrol Creek drainage and the Trader's Creek drainage are managed as old-growth, while the Orchard Creek drainage is managed for primitive recreation, both retaining Wilderness potential. In Alternative B, the Naha River drainage and Orchard Creek are managed for primitive recreation and retain Wilderness potential. In Alternatives C, F, and G, the Naha River drainage is managed for old-growth and retains its Wilderness potential. The remainder of the are is essentially managed for intensive timber harvest, precluding Wilderness potential. Alternative D is mainly managed for intensive timber harvest, except the for the Naha River corridor which is managed for primitive recreation. In Alternative E, the area that is not Wilderness, is mainly managed for development, including timber harvest, precluding Wilderness potential.

(527) Neets

Gross acres: 6,315

National Forest acres: 6,315

Description

The Neets roadless area is located on the land area separating Neets Bay from Gedney Pass on the north end of Revillagigedo Island. It is an isolated area completely surrounded by timber harvest consisting only of a moderately steep, uniform, timbered slope and ridge top. There is no evidence of prehistoric or historic human use of the area. Vegetation is typical southeast Alaska coastal subalpine and alpine components of the temperate rain forest. Sitka black-tailed deer, black bear, ptarmigan and other small mammals and birds are found in the area. The area receives insignificant use by local residents and other users.

Wilderness Potential

The area is physically unaltered, but the proximity and visibility of extensive logging negatively affects the natural integrity of the area. There is some opportunity for solitude except when logging is occurring. Due to the small size of the area, proximity to logging, and lack of scenic and recreation attractions, this area does not have much opportunity for primitive recreation.

Resources

The area contains 2,667 acres of tentatively suitable forest land, however the quality of timber is low. The area does not have the resource conditions or use potential to warrant the development of specific management plans. No potential exists for the development of recreation facilities. Future use is likely to be primarily for occasional deer hunting as the area provides moderate quality deer habitat. There is no mineral potential.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	6,000	0	0
B	2,730	3,570	0	0
C	4,490	1,820	0	0
D	5,910	400	0	0
E	4,490	1,820	0	0
F	4,490	1,820	0	0
G	4,490	1,820	0	0

Consequences

In all alternatives, the entire area is managed for moderate to intensive development, including timber harvest, precluding Wilderness potential.

(528) Cleveland

Gross acres: 201,985
National Forest acres: 193,473

Description

The Cleveland roadless area is located on the mainland on the southern end of Cleveland Peninsula which is the major land mass between Revillagigedo Island and Prince of Wales Island. The community of Meyers Chuck, which is now on State owned land, was founded as a base for the fishing fleet and a cannery. The State has selected 3,365 acres within Spacious Bay. There is Native-selected land on the southwest coast that will likely be logged in the future. Ketchikan Pulp Company owns a 160-acre parcel in Granite Creek drainage which they plan to log which will require a road over Forest to saltwater. Attractions to the area include outstanding saltwater fishing in the major bays, large tidal flats at the ends of the bays, and the upland lakes between Helm Bay and Clarence Strait. There are 3 recreation cabins, a special use right-of-way for a waterline and a powerline, an electronics site, and Coast Guide permits for navigation aids in the area. The vegetation is typical southeast Alaska coastal temperate rain forest. The area has a high population of deer, bear, otter, marten, mink, loon, and common waterfowl. Trumpeter swan use the major inlets and lakes as resting areas during migration. The area receives significant local use for subsistence and recreation activity.

Wilderness Potential

The area has remained unaltered, except for Meyers Chuck, and has a high degree of natural integrity. There is excellent opportunity for solitude in all parts of the area. Except around the southwestern end of the peninsula and the shores of Helm Bay, this area offers many primitive recreation opportunities.

Resources

The area contains 83,219 acres of tentatively suitable forest land. Most of the area is included within the contingency area for the KPC Long Term Sale. The current management emphasis is on recreation use, including cabins and additional trails, and the considerable potential for fish habitat improvement. Although some hunting and trapping do occur within the area, there are no long-range plans for habitat improvement projects. There are several located and patented claims within this area and moderate potential for mineral development exists.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	42,220	52,320	98,940	0
B	63,830	33,520	96,120	0
C	132,640	56,970	3,860	0
D	94,090	12,450	86,930	0
E	132,640	56,970	3,860	0
F	132,640	56,970	3,860	0
G	132,640	56,970	3,860	0

Consequences

In Alternatives A and B, the south end of Cleveland Peninsula and the area between Port Stewart and Vixen Inlet are managed for primitive and semi-primitive recreation, and old-growth, retaining Wilderness potential. The remainder is managed for a mix of development uses, including timber harvest, precluding Wilderness potential. In Alternatives C, E, F, and G, the majority of the area is managed for intensive development, with some moderate development at the south end of Cleveland Peninsula. In Alternative D, the remaining undeveloped areas are similar to Alternative B, but there are more areas of intensive development around their perimeters which reduces their Wilderness potential.

(529) North Cleveland

Gross acres: 114,178
National Forest acres: 114,158

Description

The North Cleveland roadless area is located north of Revillagigedo Island and includes land on Cleveland Peninsula, an extension of the mainland, and the islands in Behm Canal. The east boundary coincides with that of Misty Fiords National Monument. The area is characterized by very rugged terrain with steep mountain slopes causing deeply incised drainages. There are many lakes and even a few small glaciers. Some coastal locations were occupied by prehistoric and historic Native cultures. There are two commercial lodges, on Bell Island and in Yes Bay, and other commercial recreation uses closely tied to the excellent salmon fishing in the adjacent saltwater and streams. There are 5 recreation use cabins within the area and trails to lakes in the Yes Bay and Short Bay areas. Vegetation is typical southeast Alaska coastal temperate rain forest. There are populations of deer, bear, otter, marten, mink, loon, and common waterfowl. Trumpeter swan use the major inlets and lakes as resting areas during their migrations. The main attraction of this area is its remoteness and outstanding scenery, plus excellent freshwater fishing. Bailey Bay Hot Springs has been identified as a potential Research Natural Area. The area receives significant local use for subsistence and recreation activity.

Wilderness Potential

The area has outstanding natural integrity with only one percent modified by development on Hassler Island due to an old timber harvest. All parts of the area exhibit an excellent opportunity for solitude, except possibly on the Lake McDonald, Shelokum Lake, or Reflection Lake trails. Due to the vastness of the area, the high scenic quality, and abundance of saltwater and upland lake recreation attractions, and many trail opportunities, this area has outstanding opportunity for primitive recreation.

Resources

The area contains 43,509 acres of tentatively suitable forest land. Although the area is within the KPC Long Term Sale area, the latest Operating Plan does not include timber harvest here. Recreation potential of the area centers on continued management of the cabin system, additional trails for dispersed recreation activity, possible development of the Lake Shelokum Hot Springs. Additional mooring buoys and fishing lodges in the popular bays have some potential. There is considerable potential for fish habitat improvement and fish pass construction on several streams. There is low potential for mining development in the area. There is an electronics site at Syble Point and several lighthouse or navigational aid reserves. A potential road corridor which could link Ketchikan with the Canadian Highway system by way of the Bradfield River passes through this area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	140	2,330	111,610	0
B	140	2,330	111,710	0
C	0	4,970	109,200	0
D	5,950	260	107,960	0
E	0	4,970	109,100	0
F	0	4,970	109,200	0
G	0	4,970	109,200	0

Consequences

In all alternatives, the area is managed for old-growth and primitive recreation, retaining its Wilderness potential.

(530) Hyder

Gross acres: 129,585

National Forest acres: 128,585

Description

The Hyder roadless area consists of massive angular mountains and narrow saltwater fiords located east of Misty Fiords National Monument and west of the Canadian border and Hyder, Alaska. Glaciers and ice fields are prominent in the interior and several medium-sized rivers flow through or originate in it. The area has a rich history of mining which is why it was not made part of Misty Fiords. The opportunity to view glaciers and the spectacular landscape, including the vast expanse of the Salmon River Valley, are special features of the area. Alpine vegetation dominates elevations above 2,500 feet. Below that, the steep mountainsides are heavily marked with snow and landslide paths which are typically covered with grass, alder and brush. A small population of mountain goat range over the area, as do black and brown bear and a small population of moose. The area is used by locals for trapping and some recreation. The State has selected 160 acres of land at Fish Creek.

Wilderness Potential

Except for scattered evidence of past mining, the area has remained unaltered by human activity and is surrounded by vast areas of designated Wilderness, or undeveloped Canadian land, giving the area excellent natural integrity. Within the area, opportunities for solitude are excellent, although aircraft going to and from Hyder or Canadian mining operations can be seen and heard. The area has great potential for primitive recreation, however, it is only accessible by long hikes over difficult terrain, offering a high degree of physical challenge, or by helicopter. There are two potential recreation cabins in the area and it is possible that clearing an old mining road could provide easier access to a small part of the area.

Resources

The area contains 11,882 acres of tentatively suitable forest land. Due to steep terrain and low timber volume, the potential for managing timber is low. The potential exists for additional outfitters and guide permits, for development of additional cabins and shelters, and for reopening of historic mining trails. The streams within the area are heavily influenced by glacier melt runoff, preventing any opportunity for fish habitat improvements. The level of mining activity has elevated, due partially to mines reopening on the Canadian side of the border near the area.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	128,590	0
B	0	0	128,590	0
C	27,610	32,850	68,130	0
D	37,290	24,560	66,730	0
E	27,610	32,850	68,130	0
F	27,610	32,850	68,130	0
G	27,610	32,850	68,130	0

Consequences

In Alternatives A and B, all of the roadless area except the development in the immediate area of Hyder is managed for primitive and semiprimitive recreation and retains is potential as Wilderness. In Alternatives C, E, F, and G, about half the area, mainly around No Name Lake and the Soule and North Fork drainages is managed for primitive recreation and retains its potential as Wilderness, while other portions of the area are managed for a mix of moderate and intensive development including timber harvest and loses its potential as Wilderness. In Alternative D an additional area of about 10,000 acres in the Thumb drainage is managed for primitive recreation and retains a marginal potential as wilderness.

(531) Nutkwa

Gross acres: 64,296
National Forest acres: 59,318

Description

The Nutkwa roadless area, characterized by mountain ridges separated by rather broad drainages, is located on the southwest corner of Prince of Wales Island and has always been considered a remote area. The major sounds and bays provide bases for commercial fishing including anchorages, fish processing facilities, and fish buying stations. Since the early 1900's there has been interest in mineral resources which resulted in several patented claims (300 acres) and numerous unpatented claims that are currently active. The Nutkwa area is one of the Haida Natives' traditional use areas. There is also evidence of considerable prehistoric use of coast sites. The Natives have made land selections in the northern part of this area and the State has made several selections scattered over the entire area. Vegetation is typical southeast Alaska coastal temperate rain forest. There are populations of deer, bear, otter, marten, mink, loon, and common waterfowl. The Big Creek drainage is considered an excellent example of wildlife habitat in the old-growth forest condition. The extensive canoeing opportunity is an outstanding attraction, as are the alpine lakes around the Lake Josephine recreation cabin.

Wilderness Potential

The entire area has remained unaltered by human activity so the natural integrity is excellent. Excluding the very northern fringe where the sights and sounds of logging and traffic may be evident, the area has excellent opportunity for solitude due to its remoteness and difficult access. There are outstanding opportunities for primitive recreation in many parts of this area due to the scenic, fishing, and canoeing attractions in the Nutkwa Lagoon area, and the scenic, hiking, and camping attractions in the Lake Josephine area.

Resources

The area contains 29,311 acres of tentatively suitable forest land. This roadless area is so remote and difficult to access that it receives very little management emphasis other than administration of the cabin and mining claims in the area. The area has very good timber management potential as almost all the suitable timber is near saltwater. This area has been identified as one of the "moratorium" areas pending Tongass legislation. Mineral development potential is moderate. The area has excellent potential to enhance salmon spawning habitat on many streams in the area. The Haida Native Corporation is interested in adding much of the area in their next found of selections which must be completed by 1995.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	100	6,780	52,440
B	16,950	2,770	39,600	0
C	46,470	7,910	4,930	0
D	36,640	1,580	21,100	0
E	6,520	180	180	52,440
F	25,210	6,530	27,570	0
G	37,710	7,550	14,050	0

Consequences

In Alternatives A and E, the majority of the area is recommended as Wilderness and is located adjacent to the South Prince of Wales Wilderness. The area around Sultzer Portage is managed to maintain its natural character in Alternative A, while the same area is managed for intensive development in Alternative E. In Alternative B, a small area around Mable Bay and the area around Hetta Lake and Sultzer Portage are managed as primitive recreation and old-growth, while the remainder of the area is managed for intensive development, losing its Wilderness potential. In Alternative C, the area is managed mainly for intensive and moderate development, with no Wilderness potential. In Alternative D, the areas around Nutkwa Inlet, Sultzer Portage, and Keet Inlet are managed for primitive recreation and retain Wilderness potential. The remainder of the area is managed for intensive development and precludes Wilderness potential. In Alternative F, the area is managed for intensive development except for the Nutkwa Inlet area, which retains moderate Wilderness potential. In Alternative G, the area is managed for development, except for a smaller area in Nutkwa Inlet area which has only moderate Wilderness potential.

(532) Fake Pass

Gross acres: 798

National Forest acres: 798

Description

The Fake Pass roadless area consists of a group of small, low-lying, rocky, windswept islands, including Whale Head Island, off the southern coast of Kosciusko Island in Davidson Inlet. Warren Islands Wilderness is about 15 miles to the west. These islands are inaccessible to most except the most skilled boaters. There is no prehistoric, historic, or contemporary history related to this area. Adjacent areas on the Kosciusko Peninsula have been harvested. The larger islands of this group have limited tree growth, and the smaller ones are essentially devoid of trees and other vegetation. These islands provide habitat for sea birds and mammals. Bald eagles are often seen. The area contains two somewhat exposed anchorages, but there is no freshwater, and therefore, no freshwater fish habitat. There is virtually no human use on the islands.

Wilderness Potential

The entire area has remained unaltered by human activity and has excellent natural integrity. There is excellent opportunity for solitude in the area because of its difficult access. Due to limited recreation attractions, difficult access, and the proximity of small rural communities, there is not a high potential for primitive recreation.

Resources

The area contains 718 acres of tentatively suitable forest land. These islands do not have the basic resources to require active management plans or projects. It has no potential for recreation development or enhancement. The mineral potential is low.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	20	780	0
B	0	20	780	0
C	760	40	0	0
D	660	0	140	0
E	760	40	0	0
F	760	40	0	0
G	760	40	0	0

Consequences

In Alternatives A and B, the area is managed as semi-primitive recreation and maintain Wilderness potential. In the other alternatives, the area is harvested and does not retain Wilderness potential.

(577) Quartz

Gross acres: 149,747

National Forest acres: 149,107

Description

The Quartz roadless area is a part of Misty Fiords National Monument and lies in the middle of the mainland portion of it about 50 miles east of Ketchikan. ANILCA did not include this area as Wilderness because of the pending plans to develop the Quartz Hill molybdenum mine. A special use permit has been issued to U.S. Borax for the construction and operation of a road and shore-related dock facilities. The Quartz Hill patents include 647 acres. The area is extremely rugged with massive landforms and deep, narrow fiords protruding into the land mass. The natural features of the area, scenery, and the opportunity to see wildlife and to study the processes which formed the landscape are special attractions. Alpine vegetation dominates above 2,500 feet elevation. Below that the steep mountainsides are heavily marked with snowslide and landslide paths which are typically covered with grass, alder, and brush. A small population of mountain goat ranges over the area, as do brown and black bear, and a small population of moose. Local residents use the area for recreation.

Wilderness Potential

The area is virtually unaltered except for the Quartz Hill mine and its access road, providing good natural integrity. The most significant influence is the noise and sight of a large number of aircraft on flightseeing trips during the summer cruiseship season, and the helicopters going to Quartz Hill. Otherwise, there is high opportunity for solitude in the area. Due to the remoteness of the area, the minimal sights and sounds of human activity, and the great physical challenge presented by the rugged terrain and dense vegetation, there are good opportunities for primitive recreation. Because of its inland location, it does not possess the variety of recreation attractions that are found in neighboring portions of the monument.

Resources

The area does not contain any tentatively suitable forest land. Timber management is not a consideration because of the current LUD 1 designation (manage in a roadless condition). The area is best suited for dispersed recreation. The streams in this area are important for salmon production and there may be some opportunity for fish habitat improvement. There has been much mineral exploration activity associated with the Quartz Hill molybdenum deposit. Although it is still uncertain when mine development will occur, when it does there will be much monitoring and research into the impacts of additional road building and mine excavation on fish habitat, and the effects of dumping mine tailings into saltwater.

Prescription Allocations

Acres by Prescription Grouping by Alternative

Alt	*Intensive Development*	*Moderate Development*	*Natural Setting*	*Recommended Wilderness*
A	0	0	149,110	0
B	0	0	149,110	0
C	0	0	149,110	0
D	0	0	149,110	0
E	0	0	149,110	0
F	0	0	149,110	0
G	0	0	149,100	0

Consequences

In all alternatives, the area is managed as part of the Misty Fiords Monument and would retain Wilderness potential subject to the development of the Quartz Hill Mine.

APPENDIX D

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APPENDIX D

RESEARCH NATURAL AREAS

INTRODUCTION

The following narratives briefly describe each priority and other potential candidate Research Natural Area (RNA). Each area has a map number (#) which is used to show their location on the map included at the end of the appendix. The RNA discussions are grouped by Geographic Province, as discussed in the Research Natural Area section of Chapter 3, which also explains the process used to identify and set priorities for these potential Research Natural Areas. Within each geographic province the RNAs are listed in priority order, and grouped into "priority" and "other recommended" categories.

YAKUTAT FORELANDS GEOGRAPHIC PROVINCE

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Akwe Beach

Map # 54
Yakutat Ranger District
11,032 acres

Akwe Beach contains a representative outer coast and beach segment of the Yakutat Forelands, the only extended length of sandy beach in most of south coastal Alaska. The characteristic alternating dune ridges and low wetlands (swales) of the area are believed to be geologically very recent, perhaps only 2,000 years old. Strong storms and currents of the North Pacific are still building or modifying the beach environments, creating a specialized niche for dune plants, plant communities, shorebirds, marine mammals, and other wildlife.

Akwe Beach is proposed in order to include coastal dune formations, old stabilized dunes and their vegetation, and swale wetlands plant communities. The dune ridges and swales are thought to be progressively older from the coast inland. A large freshwater lake, Triangle Lake, adds important diversity to the RNA proposal. Potential uncommon plant species include *Atriplex drymarioides*, *Lysimachia thyrsiflora*, and *Saussurea americana*. Significant wildlife habitats include freshwater wetland staging areas for migratory birds, and productive estuary. The area is within the range of moose and the glacier phase of the black bear.

2. Akwe-Ustay Lakes

Map # 61
Yakutat Ranger District
9,786 acres

This area is proposed to include two low elevation lakes at the base of the mountain front overlooking the Yakutat Forelands. Akwe Lake receives relatively small amounts of glacial sediment and is fed predominantly by rainwater runoff and groundwater. Ustay Lake is in contact with the terminus of Rodman Glacier and is cloudy with glacial sediment. The two lakes are especially suited for comparative hydrological studies.

The area offers the opportunity to study new alpine plant communities that have developed where glaciers have retreated in the Yakutat area's recent geologic past. The alpine zone on the mountain knob separating the two lakes may include a glacial refugium of higher plant diversity and should be searched for *Stellaria crassifolia*, *Stellaria ruscifolia*, *Gentiana aleutica*, *Veronica stelleri*, *Castilleja chrymactis*, and *Euphrasia mollis*. Low elevation wetlands should be searched for *Pedicularis macrodonta*. Other features of interest are black cottonwood forest and tall willow shrub plant communities.

3. Mountain Lake

Map # 4
Yakutat Ranger District
5,425 acres

This area encompasses elevations above and below the flooding zone that forms when Hubbard Glacier blocks Russell Fiord and converts it to Russell Lake. When the lake fills to about 150 feet elevation it spills into drainages leading south across the Yakutat Forelands into the Pacific Ocean. The southern portion of the area includes the upper portion of one of these outlets leading to Situk Lake.

Areas below the floodline are covered with a maturing Sitka spruce forest that developed on a former lake bottom sometime after 1150 AD when Hubbard Glacier began its retreat from Yakutat Bay. In 1986, an ice dam temporarily formed and partially flooded the fiord, killing vegetation that was underwater for more than 2 weeks. The ice dam is forming again and may burst as in 1986 or it may stabilize and make the lake permanent.

Low elevation slopes above the floodline support old-growth western hemlock-Sitka spruce forest which is relatively restricted in this part of Southeast Alaska. The area encompasses Mountain Lake, a narrow elongate lake carved into bedrock in a direction parallel to the flow of ice when it filled Russell Fiord. Alpine zones in the area may have been a glacial refugium, and should be searched for *Stellaria ruscifolia*, *Veronica stelleri*, *Castilleja chrymactics*, and *Euphrasia mollis*.

4. Pike Lakes

Map # 51
Yakutat Ranger District
1,822 acres

Pike Lakes are the only lakes in coastal Alaska south of the Alaska Range that are inhabited by northern pike. It is not known how this interior fish species reached the area. The area also includes one of the only coastal stands of the interior variety of lodgepole pine and several ice block depression lakes with different hydrological characteristics.

The area supports examples of old-growth western and mountain hemlocks, lodgepole pine, and Sitka spruce. The old-growth Sitka spruce-western hemlock forest type occurs on larger raised moraines, unlike the great majority of stands of this type in northern Southeast Alaska, which occur on steep unstable mountain slopes. Forest types that have developed on both coarse-textured well-drained soils and poorly drained organic soils are present.

The Pike Lakes RNA should be searched for special plants, especially *Eleocharis kamtschatica*, *Lysimachia thyrsiflora*, and *Pedicularis macrodonta*. The area is within the range of the glacier phase of black bear. Moose browse shrub habitat and graze on aquatic vegetation of the larger lakes. The upper reaches of streams are probably rearing habitat for sockeye salmon. The lakes are locally important waterfowl habitat.

5. Upper Situk

Map # 6
Yakutat Ranger District
2,723 acres

This area is proposed to represent excellent moose habitat in the willows occupying the complex overflow channels of the former Russell Lake, and productive fisheries. When Hubbard Glacier dams Russell Fiord again and causes Russell Lake to spill over to the south this area will be modified again. The segment of the Situk River within the area currently contains high-quality king and coho salmon rearing habitat and supports sea-run cutthroat and fall run steelhead; it has not been stocked. The fishery could be largely destroyed during lake overflow or it may partially survive.

The area should be examined to see if it contains the uncommon plants *Lysimachia thyrsiflora*, *Pedicularis macrodonta*, and *Saussurea americana*.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

6. Lost River

Map # 52
Yakutat Ranger District
821 acres

This short river supports a late (February) run of coho salmon, offering a food resource to predators at a critical time of the year. The other features of interest are the shrub communities on the complex former Russell Lake overflow channels.

LYNN CANAL GEOGRAPHIC PROVINCE

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Warm Pass

Map # 2
Juneau Ranger District
10,560 acres

Subalpine fir has a highly restricted distribution in Southeast Alaska. It occurs mainly along a few low elevation corridors into British Columbia. Warm Pass is proposed as an RNA in order to include the northernmost example of subalpine fir in Alaska. The forests of the middle and upper portions of the valley are pure subalpine fir stands. Warm Pass Valley is the only forested portion of the US-Canada border between the Taku River and Chilkat Pass. The valley has been an important migration corridor for interior vegetative species that mix with the coastal forest and tundra. Many of the interior species are rare in the Tongass National Forest. The interior alpine species *Dryas integrifolia* was collected in the RNA in 1988. Other possible uncommon species that should be searched for are *Carex interior*, *Carex atrostachya*, *Cypripedium montanum*, *Calypso bulbosa*, *Geocaulon lividum*, *Thlaspi arcticum*, *Viola selkirkii*, *Chimaphila umbellata*, *Phyllodoce empetriformis*, *Phacelia mollis*, *Plagiobothrys cognatus*, *Castilleja chrymactics*, *Symphoricarpus albus*, *Lactuca biennis*, and *Crepis elegans*.

Warm Pass Valley has a very different climate than most of Southeast Alaska. Because of a pronounced rainshadow effect, annual precipitation is much lower than typical coastal forest and mountains; the total precipitation at nearby Skagway is only 26 inches. The low elevation connection to interior British Columbia allows cold dry air to move through the valley in the winter. Laughton Glacier and an unnamed glacier occupy two tributary valleys on the north-facing side of the Warm Pass Valley. Both glaciers have retreated significantly in the last several decades and appear to be still contracting. A considerable amount

of recently deglaciated land is in various stages of plant colonization. The south-facing slopes across the valley a very short distance from the terminus of both glaciers were burned over in a forest fire. This may be the closest that forest fire and glaciers have occurred in North America.

The valley supports a good population of moose that utilize both the alpine shrub belt and riparian shrubs at lower elevations; moose trails and signs of browsing are abundant. Portions of Warm Pass Valley are used intensively by brown bear. Mountain goat inhabit the area.

Preliminary information about Warm Pass has been shared with the British Columbia Ecological Reserves Unit. RNA establishment and documentation here provide an excellent opportunity for international cooperation.

2. Dayebas Creek

Map # 57
Juneau Ranger District
8,724 acres

Chilkoot and Chilkat Inlets at the head of Lynn Canal are funnels for cold winter winds moving down from the low passes at the northern end of Southeast Alaska; this region also has the highest summer temperatures and the least annual precipitation in Southeast Alaska. This climate is highly localized to the long steep fiord walls leading up from tidewater shores. Dayebas Creek is a short tributary valley opening onto Chilkoot Inlet or Tayia Inlet across from Haines. Dayebas Creek is proposed in order to include vegetation growing in this special climatic region including uncommon forest and tundra plants and unusual forest types. The region has served as an important migration corridor for coastal plants moving inland and interior plants moving into the coastal region. The proposed RNA also contains significant mountain goat habitat, an old hanging glacial cirque basin, periglacial features, and a large waterfall.

The lower elevations of Dayebas Creek are covered with a successional paper birch-Sitka spruce forest, one of the only areas of this unusual forest type in the Tongass National Forest. Western hemlock is slowly replacing the birch on all but the rockiest sites. Exceptionally large tree-sized Sitka willows are scattered among the paper birch-spruce stands. These stands appear to have originated from fire, which is very rare on the Tongass National Forest. Some subsequent timber harvesting took place near tidewater. Steep convex slopes have very shallow soils over bedrock that support a dry lodgepole pine-lichen forest type. A mixed subalpine fir-mountain hemlock forest occupies the highest forested elevations. This area has the greatest tree species richness outside the southern fringe of the Tongass National Forest.

Tundra communities above treeline are an unusual mixture of interior and coastal alpine types. Two plants on the list of uncommon Tongass National Forest

species were collected in the area in 1988, the interior alpine species *Dryas integrifolia* and *Diapensia lapponica*. The alpine species *Minuartia biflora* was also collected in the area, the first collection in Southeast or coastal Alaska for this species. Identification of other specimens collected late in the 1988 field season is underway. Other possible uncommon species that should be searched for are *Carex interior*, *Carex atrostachya*, *Cypripedium montanum*, *Calypso bulbosa*, *Geocaulon lividum*, *Thlaspi arcticum*, *Rorippa obtusa*, *Viola selkirkii*, *Chimaphila umbellata*, *Phacelia franklinii*, *Plagiobothrys cognatus*, *Castilleja chrymactics*, *Symphoricarpus albus*, and *Crepis elegans*. Within the tundra containing interior plant species are frost-sorted stone nets and other periglacial features. Steep talus slopes that experience active frost heaving are rich in alpine species although the total plant cover is low.

The lowermost portion of Dayebas Creek plunges over the vertical wall of the fiord forming a large waterfall. The waterfall splashes directly into saltwater. The tidewater shoreline of the area runs almost directly north and south except for a short east-west segment immediately south of the waterfall. The short east-west ridge is bathed in spray rising vertically from the splash zone of the waterfall and is covered in a lush growth of mosses and lichens which should be searched for unusual species.

Lush alpine meadows that have not been recently glaciated provide excellent mountain goat foraging habitat. Evidence of goat grazing is abundant and at least two bands of goats were seen during the 1988 site visit. The area has other important features of goat habitat including cliffs that serve as escape terrain and easy access to both high elevation summer habitat and low elevation winter habitat.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

3. Lower Endicott River

Map # 44
Juneau Ranger District
9,418 acres

Endicott River served as an outlet for glacial meltwater flowing eastward from Glacier Bay when the Grand Pacific Glacier filled the bay 200 years ago. As the glacier thinned and retreated, a low ridge at the head of Endicott River (Endicott Gap) emerged and rerouted the water and cold air southward down Glacier Bay. Vegetation of the Endicott River watershed has thus developed under both ice-affected and ice-free conditions during the last several centuries. The lower watershed is at the edge of the special northern Lynn Canal climate of drier and more continental conditions.

The interior alpine species *Dryas integrifolia* has been collected in the vicinity. *Cypripedium montanum*, *Chimaphila umbellata*, and *Euphrasia mollis* have been collected across the divide in Glacier Bay National Park. *Lactuca biennis* has been collected north of the RNA near Davidson Glacier. Other possible uncommon species that should be searched for are *Carex interior*, *Carex atrostachya*, *Thlaspi arcticum*, *Viola selkirkii*, *Castilleja chrymactics*, and *Crepis elegans*. The distribution of these species in the lower Endicott River watershed is not well understood, and additional collections are needed. The William Henrey Mountain area appears to have the highest potential for the uncommon plants.

This area offers the opportunity to conduct watershed studies, especially the development of aquatic and riparian ecosystems in relation to glacial outwash events. The area also contains western hemlock-Sitka spruce forest communities typical of the northernmost portions of the Tongass National Forest. This proposal is entirely within designated wilderness, A future possible road connection route between Haines and Juneau may access the lower Endicott River drainage outside of the Wilderness; such access may improve research opportunities for this area. Future road access will require more intensive management to maintain the qualities of the area as an RNA.

4. Berners-Lace River

Map # 3
Juneau Ranger District
23,964 acres

The Berners-Lace River RNA proposal is designed to encompass two contrasting low elevation major river segments and associated ecosystems. The Lace River floodplain is a poorly vegetated, braided river channel that is typical of glacially-fed rivers. Sediment from glacial meltwater builds up on the bed of the river faster than the river can transport it away. The active river channel eventually becomes higher than the surrounding landscape and during a high water event (sometimes a prolonged period of warm, dry weather that causes high glacial melt) the river spills over into surrounding lower terrain and abandons the old channel. This process has formed a typical broad, meandering, and poorly vegetated glacial floodplain at Lace River.

Berners River received great volumes of meltwater from the glacier flowing south off Sinclair Mountain, until the glacier retreated far enough to expose a low bedrock divide at the head of Berners River valley. The entire meltwater flow has since been routed down the Lace River drainage. Berners River is now a classic underfit river, one that is considerably smaller than that of the flow regime that formed its valley.

The continued buildup of sediments at the mouth of Lace River in upper Berners Bay is damming up the mouth of Berners River. As a result, the broad floodplain of Berners River is a very large and dynamic wetland complex. Vegetation of

the Berners valley is predominantly submerged and emergent aquatic plants with fringing freshwater sedge marshes. The valley is prime moose, waterfowl, and furbearer habitat. The sloughs and lakes connected to the Berners River channel are excellent anadromous fish habitat. Several well-worn trails along the sides of the valley and other sign attest to a large population of brown bear.

The vegetation of Berners River valley suggests that a rise in water level from the damming action at the mouth of the river continues. Shrubs that once occupied raised levees are now being drowned, and extensive areas of floating mat vegetation occupy the valley. As a result, unlike much freshwater wetland vegetation in Southeast Alaska, the Berners River wetlands are being renewed and are not degenerating into acidic muskegs with low wildlife productivity.

A young cottonwood forest occupies point bars along the active channel of the Berners River floodplain. Slopes on either side of the valley are covered with a northern variant of western hemlock-Sitka spruce forest types.

5. Katzehin River Meadows

Map # 58
Juneau Ranger District
5,282 acres

As one travels north along Lynn Canal, Katzehin River is the last major river flowing west from the mainland before the special climatic zone at Skagway. An RNA is proposed here to include productive and species-rich alpine and subalpine meadow communities, treeline mountain hemlock sites, and a northern example of western hemlock-Sitka spruce communities. The area contains extensive summer grazing habitat for mountain goats. Goat trails, terraces, and droppings are widespread and goats are consistently observed in the area during the summer.

Treeline plant communities include a mountain hemlock-copperbush (*Cladothamnus pyrolaeflorus*) open woodland. Extensive *Lutkea pectinata* patches cover talus and semi-stabilized boulders. Shallow depressions collect thick snowbanks and are species-poor, mainly a *Phyllodoce aleutica-Cassiope mertensiana* community. Meltwater coming off persistent snowbanks however produces a snowbank community that is rich in herbs, including species of *Saxifraga*, *Valeriana*, *Campanula*, *Anemone*, and *Viola*. Above treeline are an open grass and sedge subalpine meadow. Species that are common there include *Carex nigricans*, *Luzula parviflora*, *Deschampsia caespitosa*, *Phleum commutatum*, and *Trisetum spicatum*.

Western hemlock-Sitka spruce forest types occupy the lower elevation slopes. Forests on the south-facing slopes above Katzehin River are especially large and well developed for a site so far north in the Tongass National Forest. The

north and west-facing slopes of the RNA are especially steep and broken by cliffs even though there is a nearly complete forest canopy. Where groundwater moves over the cliffs and steep slopes by sheet flow, a Sitka spruce/devil's club forest type occurs.

The lowermost portion of the area includes a section of the braided channel of the Katzehin River. Sediment from meltwater at the terminus of Meade Glacier is causing the Katzehin River to aggrade or build up its bed. The active river channel has shifted frequently, and most of the floodplain is in very early vegetative succession. Even though total plant cover is low on the floodplain, a distinctive set of species is found in the open and changing habitat. The terminus of Meade Glacier has retreated and thinned considerably in the last several decades, but a minor readvance of only a few kilometers would bring it to the edge of the RNA.

COAST RANGE GEOGRAPHIC PROVINCE

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Blue Lake Lava

Map # 24
Misty Fiords National Monument
19,323 acres

This proposed RNA is located along the US-Canada border and contains a recent lava flow that originated in British Columbia. Because of its southerly location and connection to a valley leading into British Columbia, the area may contain some plant species uncommon on the Tongass National Forest and stands of subalpine fir. The area is also proposed in order to obtain examples of mountain hemlock forest types on soils not affected by the recent lava flows. The British Columbia Ecological Reserves Unit has been informed of the RNA proposal and are interested in international cooperation.

A radiocarbon sample of a log at the surface of the lava was dated at 360 plus or minus 60 years. Two other flows overlap the main, dated flow. Their form as well as younger vegetation on them suggest that there were two periods of volcanic activity more recent than 360 years ago. The lava flows contain smooth, ropy "pahoehoe" surfaces and blocky "ah-ah" deposits. Isolated "islands" of forest surrounded by recent lava called steptoes are present. A cone near the lower end of the flow probably represents a secondary vent. Lava contraction (from cooling) features such as drainage gutters and circular pits occur in the area, too. The area should be searched for lava tube caves.

The volcanic vent is 5 kilometers north of the U.S. border in British Columbia. The vent erupted laterally near the terminus of a small valley glacier. The flows moved south 12 kilometers down Lava Fork River, continued across the border and spread into a fan at the confluence with Blue River, damming it to form Blue Lake. The lake gets its name from the blue or aquamarine color of the water that is caused by the Tyndall effect; light is refracted on the suspended clay particles in the water. The lava continued south about 9 kilometers down Blue River valley and then stopped. There are numerous small ponds on the lava surface where water has filled depressions.

Plant succession has been relatively rapid on the lava because of the high rainfall environment of Southeast Alaska. Vascular plant communities have developed where fine soil particles collected on the lava. On some lava surfaces black cottonwood trees have developed an unusual growth form with multiple root crowns and adventitious roots extending from the stem out across the surface. Lush mats of moss and rich lichen beds are found on portions of the lava surface. However, most of the lava is still barren rock. The area offers the opportunity to compare rates of weathering of lava surfaces with other environments in the world, and is of special interest because of the unusual combination of cool and high rainfall conditions.

2. Martin River

Map # 78
Misty Fiords National Monument
6,213 acres

This area would target study of riparian spruce and brown bear along a major mainland stream. The Martin River site appears to have better spruce stands than other proposed locations, avoids anticipated recreation uses, and has the added benefit of being adjacent to the existing Red River RNA. Access to Martin River can probably be by water; other proposed sites would require a helicopter.

3. Robinson Lake

Map # 50
Misty Fiords National Monument
4,297 acres

This area is focused on a natural slump lake, forest types typical of the southern portion of mainland Southeast Alaska, and some uncommon plants of restricted distribution in Alaska that may occur in the area. Robinson Lake formed in recent years when a natural earthslide dammed Robinson Creek. The geomorphology and stream morphology of the area have been intensively studied by the Juneau Forestry Sciences Laboratory. The area extends to the shore of Behm Canal in order to include habitat diversity associated with the shoreline and proximity to deep water. Warmth given off by deep water often delays the onset of winter snows, reduces total snow accumulation at low elevations, and initiates early snowmelt in the spring.

There has been little study and documentation of terrestrial vegetation and wildlife features in the area. The area probably contains examples of the western hemlock/swordfern type, the western redcedar/swordfern type, and relatively minor amounts of riparian Sitka spruce forest. Higher elevations probably contain mountain hemlock types, and high and low elevation muskegs are present. Uncommon species of the Tongass National Forest that should be searched for in the area are *Caltha biflora*, *Monotropa uniflora*, *Platanthera gracilis*, *Oxycoccus palustris*, and *Lycopus uniflorus*.

4. Twin Lakes

Map # 56
Wrangell Ranger District
7,202 acres

The Stikine River is one of the few low elevation corridors from the interior of Canada that reaches the coastal forest region of Southeast Alaska. The river carries a heavy glacial sediment load and has a typical braided floodplain with much early successional shrub vegetation. The Twin Lakes area includes extensive willow stands on the Stikine floodplain that are continually renewed by the river and are excellent moose habitat. The Stikine floodplain is one of two locations in Alaska where garter snakes have been collected, probably as the result of their rafting down the Stikine River. The long-toed salamander has also been reported from the floodplain. Twin Lakes (also known as Figure Eight Lake) is located in the center of the area. The lake serves as an important coho salmon rearing habitat and supports sea-run cutthroats that overwinter there.

Two special vegetation types occur in the area. Higher terraces above the river support a tall black cottonwood forest, sometimes with a successional Sitka spruce understory. *Salix interior* is reported to be a dominant early successional plant on sandy river bars in this section of the Stikine River, but specimens to verify the report are not available. This would be the only known occurrence of *Salix interior* in Southeast Alaska. Slopes above the river support western hemlock forest types under the influence of down-canyon winds.

A plant new to the flora of Alaska, *Angelica arguta*, was reported in the Kakwan Point area; specimens in flower should be collected and checked carefully against *A. lucida* and *genuflexa*. *Cardamine pratensis* was reported in the RNA near Twin Lakes, a significant southern range extension for this species. *Limosella aquatica* and *Listera convallarioides* were reported in Southeast Alaska for the first time in the Kakwan Point area. Specimens for all these reports should be collected and, if verified, should be preserved in Alaska herbaria. The uncommon plant *Lysimachia thyrsiflora* has been collected in wetlands south of the mouth of the Stikine River and should be searched for in the RNA. Other uncommon plant species that may occur are *Nymphaea tetragona*, *Caltha biflora*, *Spiraea douglasii*, and *Mimulus lewisii*.

A low-grade geothermal system occurs in the area. Two tepid springs issue from host rock just a few meters above the level of Twin Lakes on its northwest shore. One spring emerges from boulders at the base of an avalanche chute. The other spring emerges from alluvium at the base of a cliff. Bedrock in the immediate vicinity of the springs is a foliated, medium-grained quartz diorite. During high water stages on the Stikine River, the water level of the lake is raised, possibly flooding the springs.

One geothermal spring has a reported summer temperature of 21 degrees C, the other a temperature of 18 degrees C. Summer temperature of the springs may be lower than the winter temperature; a reading of 26 degrees C was obtained one winter. Cold surface water flows more readily down a cliff face above the springs during the warm season, diluting the heated water. Total dissolved solids and silica content are low as would be expected in a low-grade geothermal system, although magnesium content is relatively high. There are no hydrothermal deposits. The waters of the springs have a neutral pH.

Relatively "high" amounts of recreation use occur in conjunction with a cabin and the lakes. RNA establishment would require coordinated management and monitoring to maintain the qualities of the RNA.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

5. Anan Creek

Map # 26
Wrangell Ranger District
17,586 acres

Anan Creek is designed to include a watershed with an exceptional fishery and concentration of bears. Anan Creek supports a particularly productive pink salmon fishery; the long-term mean escapement is 200,000 pinks, one of the largest salmon runs in all of Southeast Alaska. Chum, chinook, coho, and sockeye salmon, and Dolly Varden char, steelhead, and cutthroat trout are also present. Anan Creek has gravels of the ideal size for spawning salmon, a constant flow of very clean water, and very low content of fine particles that clog the circulation of oxygen-rich water through spawning beds. Anan Creek plunges over two waterfalls in its lower section between Anan Lake and Bradfield Canal. The first (lower) waterfall is passable, but an obstacle to salmon migrating upstream to the extensive spawning habitat of Anan Creek and Anan Lake and Boulder Lake. A fish ladder in a tunnel has been installed on the first falls. The second falls delays fish passage and is about 2 meters high.

The largest known concentrations of black bear in the Tongass National Forest gather here to fish for salmon; as many as 50 different black bears have been counted at the falls during a period of several days at the peak of salmon

migration. Two bear observation stations have been constructed near the two waterfalls. The abundance of fish schooled up at the base of the falls, or leaping through the obstacles attract the black bears. Despite the heavy black bear use of the area, brown bear are not uncommon on Anan Creek. Beaver are also abundant and a series of beaver ponds and channels are found above the falls.

6. Yehring Creek

Map # 59
Juneau Ranger District
19,065 acres

The Taku River is one of the few low-elevation corridors into interior British Columbia from coastal Alaska. Plant species have used this corridor as a migration route resulting in some interesting forest and tundra types. This area is proposed in order to include a short tributary stream to the Taku River that supports productive fisheries and a representative sample of plant communities along the river corridor. Yehring Creek is a rearing habitat for coho and sockeye salmon, and supports sea-run cutthroats and spring runs of steelhead. This stream has not been artificially stocked so the fish are native genotypes.

Taku Glacier blocked and dammed Taku River until the last few centuries. Recent measurements of ice volume and movement in the Juneau Icefield suggest that the Taku Glacier is in an active building phase and will dam the river again relatively soon. The lower portion of the RNA would probably be flooded when the ice dam forms. Fish populations and habitat of the entire Taku River watershed would be drastically affected by the formation of an ice dam and blockage of access to saltwater.

Subalpine fir has been collected on the outwash of Wright Glacier in the northern portion of the area along the Taku River lowlands. Extensive black cottonwood forest stands are found along the Taku River floodplain. Mountain hemlock forest types are typical of the upper slope forests in the area. Total forest cover is low because most of the area has a north-facing aspect and much of this steep watershed basin is above 500 meters in elevation. *Viola selkirkii*, a rare plant species in Alaska, may occur in the RNA and has been collected nearby.

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Crater Ridge-Freds Creek

Map # 20
Sitka Ranger District
8,630 acres

This area has been proposed in order to include examples of several major volcanic landforms and a small watershed under the unique hydrologic influence of volcanic ash soils. The area has been the subject of intensive study both from the standpoint of soils morphogenesis and ecosystem succession (Klinger, 1988) and geologic studies (Dave Brew, Jim Riehle, U.S. Geological Survey).

Crater Ridge is a caldera (collapsed volcanic summit) on a subsidiary volcanic cone 3 kilometers northeast of Mount Edgecumbe. Crater ridge is a composite dome (made up of lava flows alternating with ash) and stands about 500 meters in elevation. Two small lakes currently occupy a minor portion of the floor of the caldera although some volcanic deposits suggest that an eruption once took place in a large caldera or "crater" lake. The profiles of Mount Edgecumbe and Crater Ridge are smooth and symmetrical, evidence that they were not carved by glaciation and thus were erupted since the end of the last Ice Age 14,000 years ago. Radiocarbon dates indicate that the various volcanic layers were erupted over a time period lasting a few hundred to 2,000 years, just prior to 9,000 years ago. A relatively thin ash layer was laid down in one or two later and final eruptions about 5,000 years ago. Buried trees and soil indicate that forest vegetation was well developed on the volcano before the final eruption. The south Kruzof volcanic field contains tholeiitic basalt and younger calcalkalic flows and pyroclastic rocks. The volcanic activity on Kruzof is of particular interest as it is related to plate movements and the complex process of terrain accretion which occurred during the late Cretaceous and early Tertiary time, and subsequent crustal movements.

Freds Creek drains the east slope of the crater summit. This watershed from summit to tidewater will allow studies of the influence of recent volcanic ash on stream flow regime and water chemistry. Porous ash soils can store large volumes of water and releases it steadily so that it stabilizes stream flow and temperatures.

Important forest types in the area include western hemlock and riparian Sitka spruce; both are growing on special soils which may produce variants of the "typical" forest type. Small areas of western hemlock/Alaska-yellow cedar and muskeg occur in the area also. *Agrostis thurberiana*, a wetland grass species on the list of uncommon Tongass National Forest plants, has been collected in the vicinity and should be searched for in the area. The area is also at the

northern limit of salal (*Gaultheria shallon*). Klinger (1988) describes in great detail a transect from near sea level to high elevations on Mt. Edgecumbe including information on soils chemistry, forest composition, age, and structure. His data have been used to propose his controversial ideas relating to the role of *Sphagnum* mosses in bog formation and forest decline, with its implications for atmospheric chemistry. Long-term protection and monitoring of these sites could eventually test whether these hypotheses explain the natural successional processes occurring over this complex terrain.

Recreation is an important use of the Crater Ridge-Fred's Creek area. There is a public recreation cabin, and the Mount Edgecumbe National Recreation Trail. RNA establishment would require close coordination with recreation administration to maintain the RNA qualities.

2. Myriad Islands

Map # 14
Sitka Ranger District
302 acres

Myriad Islands are a set of numerous wave-battered, low elevation islands fronting the open North Pacific Ocean in the West Chichagof-Yakobi Wilderness. An RNA is proposed here to include islands of all sizes demonstrating biogeographic effects due to size and isolation from Chichagof Island, probable nesting habitat of the marbled murrelet, and the Sitka spruce/Pacific reedgrass forest type. The degree of isolation from Chichagof Island is unknown as some islands are only 1/4 mile from Chichagof and Herbert Graves Islands. Marten, an introduced species to islands in Southeast Alaska, is present on Chichagof and Herbert Graves Islands, but their absence or presence on the Myriad Islands is unknown. Cooperation with the State of Alaska would allow the establishment of a reserve on adjacent intertidal and subtidal habitats that are closely linked with island ecosystems. Rich kelp forests, shellfish beds, and populations of sea otters are important features of the state tidelands.

This area is free from local and regional sources of air pollution; winds arriving at the area have been cleansed by a long passage over the North Pacific Ocean. The area would make an excellent global background air quality monitoring site. It represents one of the most outstanding opportunities to study island biogeographic effects in north temperate marine and terrestrial ecosystems in the National Forest system. The islands are popular with ocean kayakers.

3. Plotnikof-Port Banks

Map # 45
Sitka Ranger District
16,723 acres

This area is proposed to include an oligotrophic rock basin lake system with high fisheries diversity, riparian Sitka spruce, western and mountain hemlock

types, Alaska yellow-cedar, and muskegs. Two uncommon plants of the Tongass National Forest that may occur in the area are *Poa leptocoma* and *Stellaria crassifolia*.

Ice Age glaciers carved the southern portion of Baranof Island into a series of parallel northeast-southwest trending fiords and U-shaped valleys. Port Banks is a fiord-like inlet that runs perpendicular to the orientation of most of the fiords of the island. Upstream from Port Banks the glacial U-shaped valley connected to it curves back to the general orientation of the island's fiords. The valley is occupied by two large lakes, Plotnikof and Davidof. Davidof Lake is a low elevation hanging cirque basin lake in the upper watershed. The watershed supports a summer run of steelhead, coho salmon rearing habitat in the lakes, an early run of coho, and overwintering populations of sea run cutthroat or Dolly Varden.

The lower segment of the area contains shoreline along Whale Bay and some exposed open coast of the North Pacific.

The Chatham Area indicates there is "intense" recreational interest in the Plotnikof-Point Banks area. Two public recreation cabins and trails are present in the area. The fisheries resources were probably modified through some past management activities.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

4. Lake Eva

Map # 17
Sitka Ranger District
5,172 acres

The Lake Eva area is proposed to represent a highly productive sockeye fishery with an active history of research (Robert Armstrong's classic studies of arctic char, for example). Forest types present are typical spruce and hemlock, which have potential to serve as baseline monitoring sites for adjacent managed areas. Logging activity began in nearby watersheds in the 1960' and 70's. Lake Eva is a low elevation (less than 70 meters above sea level) valley morainal lake. The lake is about 3 kilometers long by 0.5 kilometers wide. The features present in the Lake Eva RNA partially overlap the proposed Plotnikof-Port Banks RNA. Lake Eva is much better studied than Plotnikof-Port Banks and it is more accessible to researchers. However, regional direction for RNA's requires that features that can be found in LUD 1's (designated Wilderness Areas) be selected in preference to other more intensive land uses. Plotnikof-Port Banks is a LUD 1 and Lake Eva is designated LUD 2. A public recreation cabin, two shelters and a trail constructed in the 1930's by the Civilian Conservation Corps exist in the area.

5. Redoubt Lake

Map # 55
Sitka Ranger District
6,453 acres

Redoubt Lake is one of the only large meromictic lakes in the Tongass National Forest. Meromictic lakes are characterized by a stable bottom layer that does not mix or "turn over" during the fall when cooling surface waters sink. This sinking action or annual flushing is important in aquatic ecosystems because it brings nutrients back up from the depths into the upper layers where they are available for use by photosynthetic organisms.

The factor responsible for the meromictic character of Redoubt Lake is the presence of a marine saltwater layer at the bottom of the lake. The surface of Redoubt Lake is only slightly above sea level and the lake is separated from Redoubt Bay only by a bedrock sill at the outlet. High tidal or storm surges push saltwater over the sill. Saltwater is more dense than the freshwater of the lake and settles to the bottom no matter what the temperature.

The saltwater/freshwater density-stratified water column represents a chemocline. Once in place the salt layer is generally stable and will not allow mixing. Nutrients contained in dead organisms filtering to the bottom are trapped in bottom sediments and subtracted from the ecosystem. However, freshwater springs seeping through fractures in bedrock may enter the bottom of the lake and gradually degrade the chemocline by dilution until it is renewed by saltwater intrusion. In some situations meromictic lake systems have been reported to act as effective concentrators of solar energy in the unmixed bottom layer, producing unusually warm temperatures at the bottom. Redoubt Lake offers the opportunity to conduct studies of these physical and ecological phenomena.

The watershed of Redoubt Bay has a history of some logging dating back to Russian colonial times. Present management on adjacent State Lands may have an affect on this area. The watershed has been stocked with game fish and the lake was fertilized at one time in an unsuccessful attempt to increase its productivity for game fish. Currently the Forest Service and Alaska Department of Fish and Game are experimenting with sockeye egg incubation; there may be possible future lake fertilization projects. The area contains a public recreation cabin and an administrative cabin. A hand-operated tramway has allowed small boat access to the lake; the tramway is to be reconstructed in 1990. Sport fishing use is relatively high. The area also contains a cultural site.

6. Lover's Creek

Map # 23
Sitka Ranger District
3,415 acres

An RNA is proposed here in order to represent several phenomena associated with exceptionally high precipitation. This area is located in possibly the highest rainfall zone in North America. The official Weather Service station at Little Port Walter, a few kilometers east of the RNA, records a long-term average annual precipitation of 569 cm (224 inches); the 1987 annual total was 742 cm (292 inches). Because of orographic uplift (winds forced to rise over mountains), total precipitation in the upper elevations of the RNA is likely significantly higher.

This area contains productive fisheries, and alpine, rock and snow avalanche communities that occupy unusually low elevations. The proximity of the area to the open North Pacific and the unimpeded movement of storms into the area from the southwest probably result in a low freezing level and high snowfall total. As a result, treeline occupies a low elevation and much of the vegetation of the steep watershed basin is alpine tundra.

The Lover's Creek area is of interest because it displays Sitka spruce-western hemlock and yellow-cedar forest types that have developed under high rainfall conditions. The area should be searched for the uncommon plants *Agrostis thurberiana*, *Stellaria crassifolia*, *Rhododendron camtschaticum*, and *Mimulus lewisii* (collected 12 kilometers to the north at Cliff Lake).

Fisheries research has occurred in this proposed area since 1934, providing possibly the longest continuous record of pink salmon production on the Pacific coast. A record of air and water temperatures and stream discharge is available from the site, as well as biological information on salmon. It has been proposed for designation as an RNA as early as 1972 by the National Marine Fisheries Service and a variety of State-wide and region-wide scientific committees.

Vegetation of this area is similar to Plotnikof-Port Banks, although the high rainfall, record of environmental data, and research history make it unique.

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Chaik Bay

Map # 19
Admiralty Island National Monument
8,314 acres

The significance of high-productivity, low-elevation riparian Sitka spruce habitat for a variety of important game and other wildlife specie, has become more widely understood in recent years. These high-productivity stands have been the focus of commercial timber management in the Tongass National Forest, and obtaining good examples for the RNA network in most of the major different forms they occur in the Forest becomes more difficult with time. Chaik Bay in the Admiralty Island National Monument and Wilderness is a superlative example of riparian spruce typical of the large islands of the Forest. The river entering Chaik Bay flows through a broad, low elevation floodplain that occupies most of the watershed. The riparian spruce stand at Chaik Bay is one of the most extensive areas of the type on the large islands of Southeast Alaska that has not been entered for commercial timber harvest.

The area contains exceptional brown bear habitat and productive fish habitats. Sitka black-tailed deer and bald eagle make intensive use of the low elevation forests. Beaver activity influences the riparian river bottom habitat. Marten and hairy woodpecker could be expected in the area. However, low elevation forests at Chaik Bay are not affected by the set of mammals that are common on the mainland but absent on Admiralty Island; these mammals include lynx, coyote, black bear, gray wolf, mountain goat, snowshoe hare, northern flying squirrel, and northern red-backed vole.

Other forest types include western and mountain hemlock, and low and high elevation muskegs. The Chaik Bay area includes broad and nearly level alpine benches at the north and south end of the watershed. The uncommon Tongass National Forest plants *Mimulus lewisii*, *Veronica stelleri*, and *Castilleja chrymactics* should be searched for in the alpine meadows of the RNA.

2. Gambier Bay

Map # 16
Admiralty Island National Monument
4,777 acres

Gambier Bay was named for an official of the British Admiralty office during the voyages of the explorer Captain George Vancouver. The area is proposed as an RNA in order to include productive wildlife habitat and a variety of special geological features. The Gambier Bay area includes the shoreline of Snug

Cove, a shallow arm of the restricted-circulation bay, and a segment of rocky shoreline along Stephens Passage. A Forest Service recreation cabin adjacent to the proposed RNA accommodates visitors. The Gambier Bay shoreline is a popular brown bear hunting area. The diverse geology, and the forests that have developed in response to the diverse geology, have been the subject of recent study, including the establishment of four intensively mapped permanent forest reference plots (0.1 to 0.25 ha, data available from Alaback and Juday), one of which has been monitored since 1979.

The shoreline of the Snug Cove portion of the area supports a very high density of nesting bald eagles. The area supports a high population of Sitka black-tailed deer and is representative of high-quality, low elevation old-growth forest habitat important for foraging and shelter from snow. Brown bear are numerous in the area. The extensive tidal flat in Snug Cove is an integral part of the ecosystem of the area and is heavily used by shorebirds such as lesser yellow legs, Bonaparte's gull, sandpipers, turnstones, and plovers and to a lesser degree by great blue heron and robin. Significant numbers of migrating ducks and geese have also been reported in the area and especially in rafts or groups on the bay surface. Cooperation with the State of Alaska may allow a state reserve on the tidelands to complement the RNA.

The peninsula that divides Snug Cove from Stephens Passage (Gain Peninsula) is made up of vertically standing dolomite and limestone bedrock layers. The limestone surface is marked by solution pits - circular depressions formed by the acid groundwater dissolution of limestone bedrock. The internally-drained and nutrient-rich limestone soils produce a superlative old-growth western hemlock forest with many very large trees. Several underground streams can be heard flowing down in the limestone rock. Although the surface has no live streamcourses, cold springs emerge at the limestone-basalt contact near the Stephens Passage shoreline.

Much of the low elevation shoreline of the area is marked by a coastal staircase bench - a series of terraces and small cliffs formed by wave erosion at different past relative sea levels. These well-drained surfaces also support old-growth forest, although landslides and boulders are occasionally dislodged from the rim of the cliffs, destroying small patches of forest.

Rocky beach on the tip of Gain Peninsula and nearby Gain Island are hauling-out grounds for sea lion. Harbor seal are common in the bay.

The area contains a diverse set of plant communities representative of Admiralty Island. Sitka spruce/Pacific reedgrass open forest is found in a thin fringe along the Stephens Passage coast. Several western hemlock-Sitka spruce forest types are present, especially the Alaska blueberry and rusty menziesia types. Shore pine/Alaska yellow-cedar and shore pine/black crowberry conifer woodland

is typical of low elevation muskegs. A thin strip of large Alaska yellow-cedar trees is found along the margin of the larger muskegs and wetlands.

Well over 100 vascular plant species have been collected or noted in the area; the list of species collected, noted, or expected in the vicinity totals 430. The coastal fringe, especially along Snug Cove, is characterized by coastal elymus, Bering hairgrass, and lyngby sedge herbaceous types in decreasing elevation. The lower end of National Forest ownership (mean higher high tide) and the beginning of state tideland ownership occurs somewhere in this sequence.

Firewood gathering has affected a portion of the area, and other recreation uses will need further evaluation and coordination.

3. Tiedeman Island

Map # 10
Admiralty Island National Monument
4,750 acres

Tiedeman Island is in the center of Seymour Canal, a large inlet surrounded by Admiralty Island National Monument and Wilderness. The Tiedeman Island area is proposed in order to include exceptionally high-density bald eagle nesting habitat in an RNA and maintain the continuity of long-term eagle studies. The proposed RNA also includes the nearby Bug Islands in addition to Tiedeman Island, at the recommendation of the U. S. Fish and Wildlife Service. Muskeg and beach forest types are included in the area. The area is linked through the eagles (feeding on fish) to the marine ecosystem of Seymour Canal.

On Tiedeman Island, mature forest covers about 30 percent of Admiralty Island. Most of the remainder supports muskeg and low productivity open woodland types, only one lake and one watershed exist on the Island. Elevations on the island are below 200 meters.

A great variety of high-quality food is available to bald eagles. Fish comprise the greatest portion of the diet, although seabirds and waterfowl are seasonally important. Eagles of the area have been observed eating salmon, pollack, cod, herring, smelt, sculpins, rockfish, flounder, and halibut. Scoters, scaup, goldeneye, bufflehead, ducks, and geese are important winter food. Carrion is available in the form of seals, sea lion, deer, bear, whales, and other wildlife.

The fringe of tall mature Sitka spruce around the perimeter of Admiralty Island provides ideal nesting platforms and lookout perches. In addition to bald eagle habitat, the islands may serve as important deer winter ranges. Vancouver Canada geese nest in the area, both in the trees and on the ground.

4. Pleasant Island

Map # 5
Hoonah Ranger District
5,256 acres

The western portion of Pleasant Island is an important field site for researchers studying ecosystem development on recently deglaciated land surfaces in Glacier Bay National Park. Pleasant Island was not covered by neoglacial advances which so drastically affected Glacier Bay as recently as two centuries ago. The island is one of the closest areas with old-growth forest, lake and muskeg ecosystems to compare with the successional surfaces in Glacier Bay National Park, and has been actively used in plant succession, ecosystem processes, aquatic ecology, and soils studies.

Geologically, Pleasant Island consists of relatively young (Tertiary: Oligocene to Miocene--about 25-16 million years old) andesitic lava flows and breccias that unconformably overlie an uneven surface that cuts across much older (late Silurian: about 420-410 million years) sandstone and siltstone turbidite beds. The latter were folded, otherwise deformed, and eroded before the flat-lying tertiary volcanic rocks were erupted. "The Knob" on the island is an undated plug of basalt; it is probably the same age or younger than the other volcanic rocks. The Silurian strata are part of a very widespread group of formations that occur throughout the Alexander Archipelago. The tertiary volcanic rocks are part of a narrow belt that extends from north of Glacier Bay proper across much of Southeastern Alaska to the Misty Fiords area on the south.

Pleasant Island includes a wide representation of upland and wetland ecosystems typifying much of the northern interior island province. Muskegs include 20 species of vascular plants and 12 species of mosses and liverworts not found at low elevations in Glacier Bay. Good examples of old-growth mixed western hemlock and Alaska cedar forests occur in the eastern portion of the island. On the western portion of the island the forest primarily occupies steeper slopes along streams. The youngest surfaces, a peripheral zone near shore are covered with Sitka spruce.

Recent and ongoing studies by Daniel Engstrom have focused on the hydrological processes that operate in the complex of old-growth forest and muskeg ecosystems on the island, and an age sequence of lakes on the island. The aquatic ecosystems on the proposed Pleasant Island RNA are being used for comparisons with a wide range of aquatic ecosystem age classes in Glacier Bay National Park. Radiocarbon dating suggests some of the bog basins on Pleasant Island may be greater than 14,000 years old. Pollen and peat accumulation in lake sediment and in bogs there provide an important long-term record of large-scale ecosystem changes of significance to the Glacier Bay area as a whole.

Pleasant Island supports significant populations of bald eagle, Sitka black-tailed deer, and Vancouver Canada goose.

Access to the area is particularly good; Gustavus airport is just a few kilometers north across Icy Passage.

5. Upper Tenakee Inlet Hot Springs

Map # 9
Sitka Ranger District
15,651 acres

This is one of the few remaining pristine hot springs in Southeast Alaska. The hot water flow is concentrated in two main vents and several seeps that emerge through riparian gravel at the foot of a steep hill. The main pool is reported to have a water temperature of 76 degrees C, making it a medium-grade geothermal system. The flow rate of the combined springs is about 90 liters per minute, a moderate to low rate of flow. Sulfur content is distinctly higher (about 220 mg per liter) than at Bailey Bay Hot Springs. A large pool of hot water is generally clear and has several large old logs in it. A late winter visit during a heavy snow year showed that geothermally heated ground covers a large area around the hot springs vents.

No plant collections have been reported from the hot springs but the warm to hot soils and the special chemistry of the water could be expected to produce at least some major range extensions. Uncommon species of the Tongass National Forest that should be searched for include *Scheuchzeria palustris*, *Poa laxiflora*, *Juncus nodosus*, *Geocaulon lividum*, *Stellaria crasifolia*, *Rhododendron camtschaticum*, and *Lycopus uniflorus*. Lush moss communities line the edge of the pool. Tracks around the pool indicate that the hot springs is probably a seasonal wildlife concentration area, especially for deer and songbirds. Red squirrel were observed to be numerous and active unusually early in the year.

The entire mountain south of the hot springs is included in the RNA proposal in order to encompass the groundwater infiltration and recharge zone affecting the hot springs vents. Lengths of the unnamed river above and below the hot springs discharge zone are included in order to allow studies of the stream before and after mixing with the hot water. The RNA proposal extends across lowlands, heavily used by wildlife, to the shore of Tenakee Inlet.

Recreation use of the area will require further evaluation and coordination with the RNA proposal.

6. Swan Cove

Map # 77
Admirality Island National Monument
24,408 acres

Swan Cove is being proposed as a potential candidate RNA to replace Pack Creek RNA. This proposed RNA would represent old-growth spruce/hemlock forest types in northern Southeast Alaska, and also includes excellent examples of estuary, beach fringe, riparian, subalpine and alpine habitats. This proposed RNA includes productive brown bear, bald eagle, river otter and Sitka black-tailed deer habitats.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

7. Tonalite Creek

Map # 13
Sitka Ranger District
9,515 acres

This area is proposed in order to represent a pristine example of riparian spruce, productive bear and fisheries habitat, western and mountain hemlock, muskegs, and yellow-cedar vegetation types. There is a long history of fisheries, hydrology, and brown bear research, and one of the most productive salmon fisheries in Southeast. The research was undertaken to establish a baseline of information against which to measure the effects of road construction and timber harvest. Although riparian spruce forests are not any more extensive at Tonalite than they are at Chaik Bay, improved access and research opportunities from its proximity of recently logged areas, and a more productive fisheries make it a greater research opportunity in Tonalite Creek. The RNA committee was unanimous in its recommendation for the designation of Tonalite as a RNA, but due to the requirement of adhering to the Regional Guide we were unable to recommend it over the LUD 1 of Chaik Bay, since Tonalite does contain adequate examples of the principal ecosystems needed in the RNA system for this geographic province.

CENTRAL INTERIOR ISLANDS

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Bailey Bay Hot Springs

Map # 27
Ketchikan Ranger District
2,404 acres

In Southeast Alaska nearly all hot springs have been developed for resorts or public recreation. Modification of the springs for these purposes has resulted in the destruction of specially adapted high temperature organisms and delicate or unique rock formations. Bailey Bay Hot Springs are reported to have been tapped to some unknown degree for a resort before 1940, however, the main vents, pools, and seepage slope are reported to be in nearly pristine condition. Bailey Bay Hot Springs has the highest surface temperature of any hot spring in Southeast Alaska, and represents one of the only opportunities to include a medium to high grade (reservoir temperatures above 150 degrees C) geothermal area in an RNA anywhere in Alaska.

At least 10 major seeps and several minor seeps issue from granitic bedrock on a northwest-facing slope above Spring Creek valley; they drain into Lake Shelokum. Temperatures of the seeps range from 92 degrees C to 71 degrees C. The water at the hottest vent has a pH of 8.9 (alkali).

The freshwater wetland plant *Lycopus uniflorus* has been collected in the RNA, one of only two known collections in Southeast Alaska. The only collection in Alaska of *Campanula scouleri* was made in the area or at a nearby hot spring. The wetland grass *Poa laxiflora* should be searched for in the area; only two collections are known in Alaska.

Current development in the area of the Bailey Bay Hot Springs includes a CCC constructed 3-sided shelter, and a 2.2 mile trail which extends from Bailey Bay past Lake Shelokum and on to the shelter near the springs. The spring itself has not been developed except for placing rocks and plastic sheeting on occasion to create pools. Current use of the hot springs is low due to the poor condition of the trail. The use of Lake Shelokum, which is stocked with eastern brook trout is also low due to the trail condition.

In 1982, private interests proposed developing the spring into a resort. The resulting Environmental Assessment recommended no action and to maintain the status quo. The Ketchikan Area recommends this philosophy be continued with the establishment of a Bailey Bay Hot Springs RNA designed and managed to continue and enhance the recreation use of the area.

The following reports have been compiled by the FS for the Bailey Bay Hot springs area: 1) A Sensitive Plant Survey at the Bailey Bay Hot Springs Lake Shelokum, Southeastern Alaska, by Mary Clay Muller. 2) Geologic Report for Bailey Bay Shelokum Lake Hot Springs Resort Application, by Frederick W. Prange. 3) 1982 Environmental Assessment: Bailey Bay Hot Springs Management, signed 8/13/82 by Forest Supervisor Win Green.

2. Falls Creek Windthrow

Map # 49
Petersburg Ranger District
821 acres

This even-aged stand of spruce and hemlock in a strip going up a hillside apparently followed a catastrophic windthrow event about 200 years ago. The stand has been used for growth and yield research, and could be a valuable resource for future work on forest-soils interactions. This stand is much more productive than most forests of its age, or with its soils (Karta series), presumably due to the effect of windthrow on disturbing the soil, and, thereby, mixing organic and mineral layers. Comparisons with nearby less disturbed soils could be used for future research. The Falls Creek windthrow is currently used as a demonstration area for illustrating maximum levels of productivity in unmanaged second-growth forests. Because high volume second-growth stands have been utilized heavily in the past, they are relatively rare, and present unique research opportunities. Falls Creek is also easily accessible since it is on the Petersburg road system. This road access also results in relatively high recreation use in the area. The RNA committee felt Falls Creek Windthrow would make a valuable addition to the RNA system, primarily by representing the cell for mature second-growth spruce-hemlock forest.

3. Kadin Island

Map # 22
Wrangell Ranger District
1,523 acres

This area is proposed because of the occurrence of a unique form of high-productivity Sitka spruce/devil's club forest type. High winds moving down the Stikine River canyon pick up silt from the unvegetated glacial river floodplain and deposit it as loess on islands at the river's mouth. The continuing rain of loess onto the upper soil layers provides a supply of unleached, nutrient-rich soil material to the forests of the island. The loess deposition overcomes the process of acid bog formation (paludification) that overtakes most stable sites of moderate topographic relief in the Tongass National Forest. Few areas in the world have a combination of high rainfall and recent loess deposition, so the properties of the soils here are of special interest. Thick loess soils also have a high water-storage capacity, so the hydrology of the island is of interest, too.

The fringe of the island is subject to tidal influence and changes in water level due to shifts of the river. Wetland marsh communities should be included in the RNA if possible. Plant species uncommon to the Tongass National Forest that should be searched for include the following wetland species: *Glyceria leptostachya* (collected near Wrangell), *Eleocharis kamtschatica*, *Nymphaea tetragona*, *Caltha biflora* (observed in Stikine bottomlands near Kakwan point) and *Lysimachia thyrsiflora* (collected in Stikine River marshes).

Kadin Island bald eagle nest concentration is second only to parts of Admiralty Island, according to the U. S. Fish and Wildlife Service (personal communication).

Kadin Island is steep-sided and cone shaped in profile. Results are available from forest stand reconstruction studies during logging on nearby Vank and Rynda Islands. Access to the area is excellent; the city of Wrangell is only about 6 kilometers south of the area.

4. Port Camden Fossil

Map # 60
Petersburg Ranger District
7,920 acres

Port Camden is a well-known fossil tree and plant locality. Exposures of individual plant remains and numerous logs of early Tertiary species occur in bluffs on either side of the bay. The fossils are estimated to be over 40 million years old. Fossil stumps and logs are present as both silicified and carbonaceous remains. Tuffaceous beds (volcanic ash) that contain carbonized imprints of plants are also present. The best fossil exposures are along the shore where marine erosion removes material in the bluff and concentrates remains in the intertidal zone. Recent road construction in the vicinity carved another exposure through the fossil-bearing layer. Further excavation or accelerated erosion on the uplands may damage paleontological resources.

Several warm temperate forest species have been identified among the fossils, including bald cypress (*Taxodium dubium*), redwood (*Sequoia langsdorfii*), chestnut (*Castanea castaneaefolia*), hazelnut (*Corylus maquarii*), planetree (*Planera ungerii*), and the fern *Osmunda doroschkiana*.

This area contains mining claims. These mining claims will need to be an evaluation factor in considering final recommendations for this proposed RNA.

5. South Etolin Island

Map # 29
Wrangell Ranger District
5,346 acres

South Etolin Island is proposed in order to include an old-growth forest of fire origin, examples of the western hemlock/western red cedar forest type, and

communities within the mixed conifer series including mountain hemlock, shore pine, and red- and yellow-cedar muskeg types. Forest fires are exceptionally rare in the Tongass National Forest because of high rainfall and the lack of natural ignition sources. The principal burned area within the proposed area regenerated from a fire that occurred an estimated 300 years ago. Fire scars occur on many trees in the area, indicating that the burning history of the forest here is probably a complex mosaic. The 300 year-old fire probably escaped from native burning of a western red cedar tree or snags. Snag or tree burning was a technique natives used to hollow out logs prior to carving them with stone tools to make sea canoes. Western red cedar was the basis for the northwest Indian culture and most stands near tidewater were heavily used for items such as woven bark, baskets, house planks, poles, paddles, weirs, and canoe logs. Western red cedar is generally restricted in Southeast Alaska to areas south of Sumner Strait.

Wolves occur on Etolin Island and they range into the area of the potential RNA. Sitka black-tailed deer populations, as judged by their effects on preferred browse species, are relatively low in the area. The area offers the opportunity to investigate possible relationships between wolves and deer. South Etolin was the site of a Roosevelt elk introduction in 1987; future elk introductions are being considered.

The area contains the western hemlock/salal, the mixed conifer/salal, and the mixed conifer/salal/skunk cabbage communities which are restricted to the southern portion of the Tongass National Forest. Upper elevations in the area support the mountain hemlock/Alaska blueberry/cassiope community. Areas of beach and beach fringe communities add habitat diversity to the area.

No systematic plant collections have been made in the area but rare species that should be searched for include *Asplenium trichomanes*, *Glyceria leptostachya*, *Oxycoccus palustris*, *Penstemon serrulatus*, and *Mimulus lewisii*.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

6. Duncan Salt Chuck

Map # 21
Petersburg Ranger District
3,478 acres

A salt chuck is a brackish lagoon usually constricted by a reversing waterfall. Fresh water from a stream or river spills over a rock shelf or obstruction during low tide stages, but during flood tide saltwater or brackish water cascades over the obstruction in the opposite direction. This unusual geological feature is found only along seacoasts with large tidal fluctuations and shorelines that are dynamic and relatively youthful so that they are not yet buried by sediments.

Southeast Alaska experiences large tidal amplitudes and is dynamic because of tectonic uplift and subsidence and isostatic rebound.

Duncan Salt Chuck is one of the largest and best known salt chucks in the Tongass National Forest and is set in the Petersburg Creek-Duncan Salt Chuck Wilderness Area. The RNA proposal is designed to include shoreline and associated upland ecosystems surrounding the restricted-circulation bay or salt lagoon in which the reversing falls occurs. Cooperation with the State of Alaska will allow the inclusion of key features below mean higher high tide in a state tidelands reserve.

Extensive muskeg and wetland communities line the level uplifted marine terrace that makes up much of the shoreline of the area. These communities are highly productive for waterfowl and shorebirds, in addition, the proposed RNA is an important spring black bear feeding area, contains many bald eagle nests, and is important fish-rearing habitat. The area also contains two public recreation cabins and receives "heavy" recreation use. Little detailed inventory information is available on the plants of the area. Uncommon plant species of the Tongass National Forest that should be searched for in the area include *Scheuchzeria palustris*, *Eleocharis kamtschatica*, *Calypso bulbosa*, and *Nymphaea tetragona*.

7. West Duncan Uplift

Map # 48
Petersburg Ranger District
6,495 acres

West Duncan Uplift contains special landforms that illustrate the development of a post-glacial landscape of the major islands of the Tongass National Forest. During the time of deglaciation at the end of the Wisconsinian glacial period (12,000 to 14,000 years ago) because of the depression of the land surface by the weight of glacial ice, what is now Kuprenof Island was a series of rocky islands. As the Wisconsinian glaciers melted, vast quantities of glacial sediment were deposited among the rocky islands now comprising the mountain peaks of Kuprenof Island. Once the weight of glacial ice was removed the compressed earth crust expanded and the land surface rose by a process known as isostatic rebound. The area is made up entirely of level uplifted marine deposits.

The glacio-marine deposits within the area are predominantly silt with sand lenses and clays. Fossils of modern marine shellfish such as cockels and pearly mussels are present. The terrace has been above sea level for about 7,000 or 8,000 years. During that time a stream system incised its meandering path down through the sediment. In the incised stream system there are several features of river morphology including paired terraces, meander scars, and abandoned channels. The streams have little further erosive power because the downcutting channels have reached bedrock obstructions.

The level, low-elevation plains of the area are one of the most extensive wetlands and muskeg surfaces in the Tongass National Forest. Tidal mudflats are important for migrating shorebirds. There is one recreation cabin, and Indian Point is an inventoried site of high potential for developed recreation; present recreation users include waterfowl hunters. The area contains mining claims which will need evaluation in identifying final recommendations and final boundaries. Little information about vegetation types and plant species is available for the area.

8. McDonald Lake

Map # 75
Ketchikan Ranger District
10,788 acres

This area would target study of riparian spruce and other upland forested and non-forested habitats. The McDonald Lake area contains sites from near sea level to 3,500 feet (alpine). A full range of volume class stands (hemlock, spruce, and hemlock/spruce) are present. Hydrologic features are diverse.

All five species of salmon are present, plus steelhead, and dolly varden. McDonald Lake has historically supported one of the largest sockeye runs in Southeast Alaska. Recent fisheries enhancement to restore that run has been accomplished by fertilization of the lake (a seven-year project scheduled to end in 1989). Additional fish enhancements are being considered for the inlet. Because of the enhancement work, the area is not suitable as an RNA for fish, and the proposed boundary excludes the lake and other areas which have been altered.

An abandoned fish hatchery is located at the Walker Creek inlet to the lake. Second-growth timber stands (about 40 years old) which occurred after logging are near the fish hatchery. Yes Bay, at the outlet of the lake, has a resort and heavy recreation use; the upper end of the lake and the riparian stands, in particular, are off the beaten path. Little conflict with recreation use is anticipated. The boundary proposed for the McDonald Lake RNA excludes the abandoned fish hatchery, second growth, and heavy recreation areas.

Mountain goat, brown bear and wolves also inhabit the area.

PRIORITY POTENTIAL CANDIDATE PROPOSALS

1. Disappearance Creek

Map # 38
Craig Ranger District
741 acres

Disappearance Creek watershed is a steep north-south drainage. One entire side of the drainage is a landslide which buried the stream, and this side of the drainage currently has no trees.

The lowermost segment of the valley is reported to contain an above ground spring-fed stream course with high fisheries productivity.

2. Johnson Lake

Map # 42
Craig Ranger District
2,641 acres

Johnson Lake RNA contains a good, but small, riparian spruce stand, high fisheries values, at least two plants uncommon to the southerly portion of the Tongass National Forest, and good examples of typical southern Southeast Alaska forest types. Floodplain Sitka spruce in the RNA are very large, reaching diameters of 280 cm (110 inches); most dominant trees are 64 to 67 meters (210 to 220 feet) tall, making the stand where the trees are located one of the most superlative remaining spruce stands in Southeast Alaska.

Physocarpus capitatus is reported along freshwater stream margins in the area. *Spiraea douglasii* is reported along the lake shore. As the southernmost of the new RNA proposals for the Tongass National Forest, Johnson Lake RNA has the potential to contain several range-limited plants and animals. Some of the most significant potential plants are *Asplenium trichomanes*, *Poa laxiflora*, *Juncus nodosus*, *Platanthera gracilis*, *Viola sempervirens*, *Monotropa uniflora*, and *Stachys emersonii*.

This area is critical to the overall transportation system coordinated with the State in their Prince of Wales Area Plan, to serve several bays in the Moria Sound to Ingraham Cove area. The transportation system and log transfer facility would serve 215 million board feet, of which about 40 million board feet is in the proposed RNA.

3. Mount Calder-Virginia Mountain

Map # 25
Thorne Bay Ranger District
5,131 acres

Mount Calder-Virginia Mountain contains the only known coastal population of subalpine fir, several uncommon plant species that suggest its role as a glacial refugium, and typical southern Tongass National Forest forest communities on Prince of Wales Island. The area has a history of alpine research and will be of continuing value for additional comparative studies.

Several plants noted in the area are reported in Southeast Alaska for the first time. These species are *Androsace chamaejasme*, *Arctostaphylos alpina*, *Arnica diversifolia*, *Draba lactea*, *Draba lonchocarpa*, *Senecio lugens*, and *Woodsia glabella*. A plant identified as *Antennaria umbrinella* is reported from the area, which would be an addition to the flora of the state. However, it is known to intergrade with *A. rosea* (common in northern Alaska but only one collection in Southeast Alaska). Several plants reported on Mount Calder-Virginia Mountain are significant southward range extensions over previously known distributions in Alaska. These species include *Anemone parviflora*, *Cerastium beeringianum*, *Dryas drummondii*, *Erigeron humilis*, *Oxytropis campestris*, *Poa alpina*, *Poa arctica*, *Salix reticulata*, *Saxifraga oppositifolia*, *Silene acaulis*, *Thalictrum alpinum*, and *Tofieldia coccinea*. Most of these species are characteristic of arctic and subarctic alpine sites in interior Alaska and the high elevations of northernmost Southeast Alaska. Collectively they suggest the area may have been a glacial refugium with remnants of an ice age flora characteristic of a climate colder than that of contemporary Prince of Wales Island. Additional taxonomic work on the flora of the area is needed, with specimens deposited in Alaska herbaria.

The subalpine fir community is made up of relatively small trees in a stand that extends to treeline and includes several wind-trained, prostrate or krumholz-form trees. The stand is located on the summit and northeast-facing slopes of the Virginia Mountain ridge system down to an elevation of about 300 meters (1000 ft). The summit of Virginia Mountain and the north-facing slope of Mount Calder contain well-formed cirque basins. The south-facing slope of Mount Calder rises directly up from tidewater and contains enough rough broken ground on the summit that it may have been a nunatak during much of the Wisconsinian glacial period.

Important forest types in the area are mountain hemlock, Alaska yellow-cedar, and western hemlock series. Limestone bedrock underlies some of the area, and karst features should be looked for in the area.

The Mount Calder-Virginia Mountain area is an important part of the Primary Sale Area for the KPC long-term timber sale and has been partially roaded and logged. It contains several approved units for the 1989-1994 operating period.

The area is also included in one of the moratorium areas for HR 987. Depending on legislation and timber sale activity, the boundary of the proposed RNA can be adjusted. The primary emphasis in proposing this area as a research natural area is to capture the only known coastal population of subalpine fir.

4. Sarkar Lakes

Map # 28
Thorne Bay Ranger District
8,682 acres

Sarkar Lakes is proposed because its watershed system supports a significant run of sockeye salmon. Sockeye runs are known from only about 60 of the 3,000 streams in Southeast Alaska that support anadromous fisheries. The availability of lake habitat for a juvenile rearing stage is an important factor in high-productivity sockeye fisheries. The sockeye run at Sarkar Lakes is important for commercial and sport harvest and is monitored at a weir by the Alaska Department of Fish and Game for the US-Canada salmon treaty. The Sarkar Lakes system has high population of coho salmon, cutthroat, and dolly varden. Pink salmon also occur here.

The watershed of Sarkar Lakes is on limestone bedrock that contributes to the high productivity of the aquatic ecosystem, especially high densities of juvenile salmon. Unlike the many valley moraine lakes in the mountains of Southeast Alaska, these lakes are representative of low-elevation gently rolling glaciated terrain. Warmer water temperatures in this low elevation watershed may also contribute to high aquatic productivity. Studies at Sarkar Lakes have shown that juvenile sockeye grow faster, get bigger, and go to sea earlier than in many other lakes and streams where they occur in Southeast Alaska.

This area is an overwintering area for the trumpeter swan, and has even-aged stands.

The Sarkar area has a heavy sockeye salmon subsistence use, and heavy and growing recreation use. Coordination will be needed to accommodate these uses and maintain the qualities of the area as an RNA.

5. Thunder Mountain

Map # 39
Craig Ranger District
5,189 acres

Thunder Mountain area is proposed to include a possible glacial refugium, alpine plants uncommon in the Tongass National Forest, outer coastal forest types of the southern Tongass National Forest, potential habitat for the marbled murrelet, a karst landform, even-aged 150-200 year old productive stands on limestone, a sockeye stream and lake, very diverse wildlife, and possibly subalpine fir.

Three plant species collected at about the 950 m (3110 ft) elevation on Thunder Mountain represent significant range extensions, *Salix reticulata*, *Thalictrum alpinum*, and *Tofieldia pulsilla*. The subalpine meadow plant community types found on Thunder Mountain are markedly different than the common types of southern Southeast Alaska. The soil parent material over much of the area is marble, which is often associated with noteworthy plant communities, rare or uncommon plant occurrences, and high-productivity forest types.

Thunder Mountain rises directly from the outer coast of the open North Pacific, and has no high elevation snow-gathering areas behind it toward the mainland. The topography of the mountain is very steep, rough, and broken, not rounded and polished as much of mountainous Southeast Alaska is. The location and physiography of the area suggest that it may have been an ice-free nunatak during at least portions of the Wisconsinian glacial period.

Thunder Mountain appears to contain suitable nesting habitat for the marbled murrelet. The marbled murrelet is a seabird which feeds on the open ocean and nests in old-growth forest trees. The Threatened, Endangered and Sensitive Species section of the AMS contains more information on the marbled murrelet.

Manhatten Lake is included within the proposed area. This lake system which has contains a natural run of sockeye salmon and has been untouched by habitat manipulation or enhancement. Maintaining the lake and streams in a natural state to provide baseline information for comparison with the numerous other lakes and streams which have been manipulated or enhanced is a very high priority.

This potential RNA is bordered by Native Corporation land on the south and east. The State proposes selection of community sites across Hook Arm from the proposed RNA. Rough seas could present access problems, access across Native lands through a cooperative agreement may present a possibility.

The Thunder Mountain RNA, located on the outer coast of Dall Island, is subject to rapid changes in weather as storms from the open North Pacific Ocean quickly develop and move onshore.

OTHER RECOMMENDED POTENTIAL CANDIDATE PROPOSALS

6. Hunter Bay - Biscuit Lagoon

Map # 76
Craig Ranger District
5,243 acres

This area contains a freshwater lake and brackish lagoon environments, similar to Salmon Bay. Western hemlock, Sitka spruce, mixed hemlock/spruce, and western red cedar forest types are present in the proposed RNA.

This proposal contains habitats for a variety of wildlife species, including: bald eagles, Sitka black-tailed deer, marten, gray wolf, black bear, numerous waterfowl species, river otter, spruce grouse, Prince of Wales flying squirrel, and Prince of Wales ermine. There is a good possibility that trumpeter swans may over winter in this area, but this has not been documented.

Sockeye, pink and chum salmon are present in the area. According to the Natives in the area there is good fishing.

Even-aged second growth conifer stands occur in the area as the result of blowdown and landslides.

7. Klakas Lake

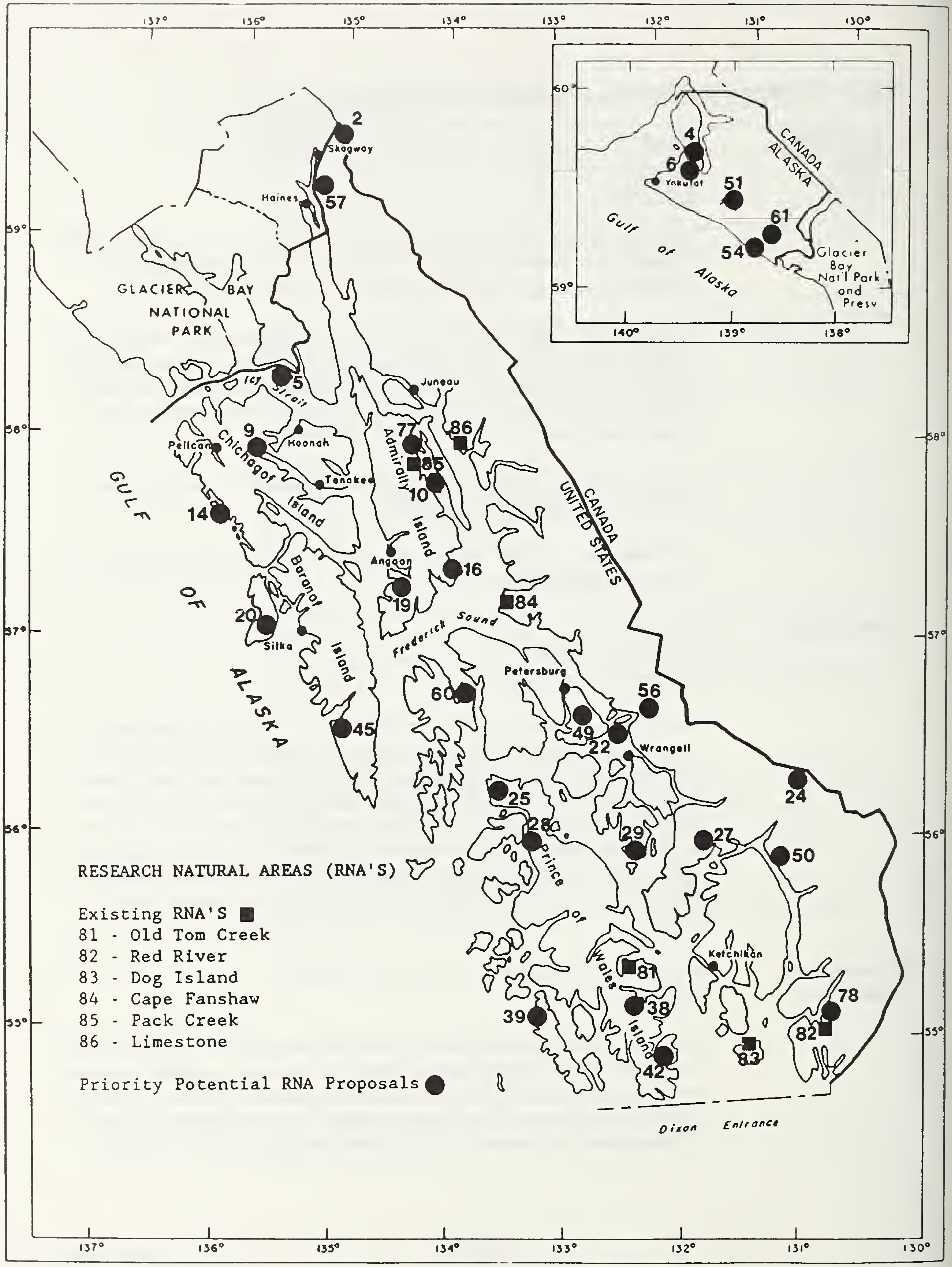
Map # 41
Craig Ranger District
7,162 acres

The Klakas Lake area is proposed for RNA status to assure a quality riparian spruce study area in each of the three provinces on the Ketchikan Area. The area would encompass the entire lake, its inlet and outlet, and a small estuary located at its outlet. Sockeye salmon are present in the lake; pink and chum salmon are present in its outlet. The inlet contains a wide active flood channel with riparian spruce. Photo interpretation indicates this area would provide a better riparian spruce forest feature than that available at Johnson Lake. Low to high volume hemlock stands are present; cedar may be present in some stands.

8. South Sumez-Angel Falls

(Not on map: boundaries have not been delineated.)
Craig Ranger District

More information is needed before this area can be proposed as an RNA. There is a possible rare lily present near Angel Falls; field searches by qualified botanists would be required to verify its presence. Recent volcanics provides a possible unique geologic feature. There may be opportunity to encompass a full range of forest types from riparian spruce to productive upland forest to muskeg.


GLACIER BAY NATIONAL PARK
GULF OF ALASKA
Icy Strait
Chichagof Island
Baranof Island
Admiralty Island
Frederick Sound
Prince of Wales Island
Dixon Entrance
CANADA
UNITED STATES
Skagway
Haines
Juneau
Hoonah
Pelican
Tenakee
Angoon
Sitka
Petersburg
Wrangell
Ketchikan
Ynkutat
Gulf of Alaska
CANADA
ALASKA
Glacier Bay Nat'l Park and Presv
RESEARCH NATURAL AREAS (RNA'S)
Existing RNA'S
81 - Old Tom Creek
82 - Red River
83 - Dog Island
84 - Cape Fanshaw
85 - Pack Creek
86 - Limestone
Priority Potential RNA Proposals